CLINICAL MEDICINE
The Modern Approach

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by

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LONDON

PITMAN MEDICAL PUBLISHING CO , LTD

First published 1960

PITMAN MEDICAL PUBLISHING COMPANY Ltd
39 PARKER STRE T LONDON W C.2

ASSOCIATED COMPANIES

SIR ISAAC PITMAN & SONS Ltd
PITMAN HOUSE PARKER STREET KINGSWAY LONDON W 2
THE PITMAN PRE S BATH
TMAN H USE, BOUVERIE STRE T CARLTON MELBOURN
22 25 B CKETT S BUILDINGS RESIDENT STRE T JOHANNESBURG

PITMAN PUBLISHING CORPORATION
2 WEST 45TH STREET NEW YORK

SIR ISAAC PITMAN & SONS (CANADA) Ltd
(INCORPORATING THE COMMERCIAL TEXT BOOK COMPANY)
PITMAN HOUSE 381 383 CHURCH STREET TORONTO

©
A E Clark Kennedy
and
C W Bartley
1960

MADE AND PRINTED IN GREAT BRITAIN BY
THE GARDEN CITY PRESS LIMITED
LETCHWORTH HERTFORDSHIRE
F0-(B-C 13)

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How to Use this Book

In order to get the most out of this book the reader should understand the reason why and the purpose for which it was written Let us start with a denial It is not a textbook Nor was it written in any attempt to replace it The textbook seems to have become far too long, factual and mentally indigestible to be read from cover to cover The explanation of this is obvious Our knowledge has advanced with great strides of recent years, and continues to advance, and the author or authors of a textbook are under an obligation to put almost everything in and to leave practically nothing out Meanwhile the capacity of the human mind has not increased by one jot or tittle since the dawn of recorded history

What seemed to us to be wanted was a relatively short book directed towards the needs of the beginner, one which explained (as far as it can be explained) rather than catalogued human disease one which could be read without too much mental indigestion and would serve as a guide to the textbook on the shelf For that although it cannot inculcate the sense of perspective which the doctor must cultivate (and which it is hoped that this book will help the reader to cultivate), must always remain the fountainhead of all knowledge and ever the ready source of help in trouble

So our method of approach has been somewhat different from that of the authors of a textbook and at first sight may appear unorthodox But it is based on the incontrovertible, and yet neglected, fact that diseases are not things which exist independently of the patients who suffer from them, as their names often suggest and which breed true to type Rather they are transient, permanent or progressive alterations for the worse in *individual* men, women and children Some are common and others rare Some are easy to understand, others

still exceedingly obscure But all must be due to reactions between an individual and his environment There can be no disease without a patient to suffer from it any more than a mind can exist in this world without a body to maintain it (No one can deny that statement of obvious fact) Nevertheless, in order to exchange information among ourselves, and maintain a common front of knowledge, we must talk about diseases as if they did actually exist But it is fundamentally important to realize clearly that in point of fact they do not

So this book is planned rather differently from the average textbook or book on any special branch of medicine In Part I an attempt is made to inculcate, as far as our knowledge permits, a working concept of the nature of the individual man, the potential patient, and the nature of his disease when he gets it, also to explain as clearly as the difficulty of the subject permits the difference between primary functional disorders and organic disease Part II gives an account of the common primary functional disorders, Part III describes the recognized organic diseases on the basis of the probable mechanism of their pathogenesis (as opposed to the particular part of the body or system mainly affected) and, when this method breaks down (as eventually it does on account of our ignorance or the probable complexity of their causation), in terms of their functional pathology or the structural change commonly associated with them Part IV is devoted to clinical diagnosis, a clinical diagnosis of some kind being, in the authors opinion, a prerequisite to the ordering of any laboratory and X ray investigation Part V sets out to give an account of the *principles* of the prevention and treatment of disease by *all* the methods now at our disposal and of the general management of any very ill patient, concluding with a section on that common, but in the ordinary textbook much neglected medical situation, namely, the care of the dying man

The beginner (although it is hoped that this book will also prove of value to others) should read Part I 'The Patient and His Disease," first This is not an easy subject but time spent on "thinking it out *now* will the authors believe, be well rewarded later Then he should skim *quickly* through Part II, Primary Functional Disorders and Part III, ' Organic Disease just to get a line on what it is all about ' After that he should

read Part IV, 'Clinical Diagnosis,' carefully, followed by Part V, 'Principles of Prevention and Treatment,'' more rapidly For from the very first moment that the student starts clinical medicine he must begin to think in terms of both clinical diagnosis *and* treatment, looking up drugs, as he encounters them in action, in the *British National Formulary* which he must always carry in his pocket If he does not think on those lines his clinical work will become slack and his knowledge of therapeutics the whole aim and object of medical practice, is likely to limp lamely along in the wake of his advancing knowledge of disease That done, he should return to Parts II and III looking up, when and as the occasion arises that particular primary functional disorder or organic disease of which he has just seen 'a case,'' so as to see it in its right place in the continuum of human disease as a whole, turning to the description of it in a standard textbook if he feels that he wants to know more details about it

This book is not intended to give a complete account of human disease, not even of that part of it which is generally conceded to medicine as opposed to surgery That would be quite impossible in a book of this size Nevertheless, if the reader uses it intelligently and makes free use of the index (specially designed for cross reference) he will build up a structure of knowledge in his mind which will save him a vast amount of unnecessary reading and cut down the enormous volume of facts that at first sight it looks as if he must needs remember For the day has now passed in which it was possible (and it is certainly no longer desirable) to think of diseases as and describe them as clear cut entities each with its pathology, symptoms signs, diagnosis, prognosis and treatment That method, although still adopted of necessity in the textbook, involves endless repetition and if followed by the student will land him in a vast amount of unnecessary work The same disease as we used to call it (in the sense that it is the same collection of symptoms and signs), may often be due we now realize to a large number of different pathological processes and the same pathological process we now realize, may lead to a large number of different diseases So the way to learn medicine today is to think, not so much in terms of individual diseases and how to treat each one separately, but in terms of

what different pathological processes can do, and how to stop each one doing it, and in terms of the different disorders of function and alterations of structure which they can produce, and how to control and remedy each one of them If the student adopts this method, he will find it much easier to answer a question about either the diagnosis or treatment of a disease in a written paper and much easier to diagnose and treat disease in his patients True that it involves more thought on his part But it will enormously reduce the factual information that he must commit to memory and, even more important, will lead him to a much clearer understanding of his patients

It is often cast in the teeth of the textbook that seventy five per cent of it deals with rare diseases which the doctor seldom sees That is true Nevertheless, to have omitted them would have been to leave out much that is interesting in medicine Further, they teach their lesson and throw light on the pathogenesis of the more common ones So we have attempted to paint in outline almost the whole picture of the natural phenomenon of human disease and can only hope that our book is so written that, when read by a student in relation to his own clinical experience *it will help him to build up that sense* of perspective so essential to his work later

Finally let us say this Our book is intended to provide the reader with a framework of basic knowledge on which by *thinking*, and continuing to think about the cases he sees and using textbooks for reference, he can build up *actively* that structure of knowledge in his mind which will enable him to practise medicine safely For, in the last analysis, as becomes patently clear when anyone really starts to think about it, no one can really be taught anything Teaching is an aid to learning, and learning an active process which everyone can accomplish only for himself

In conclusion we would like to express our grateful thanks to Mrs D Chapple for struggling so manfully with our calligraphy and to Dr Marian Veitch for so kindly reading the proofs

A E Clark Kennedy
C W Bartley

London and Cambridge
1st September, 1959

PART I

The Patient and His Disease

MEDICINE is the art which now draws freely on knowledge acquired by the scientific method of systematic observation and experiment, of getting ill people well So its practice demands some knowledge of pathology, that is to say of all that we have come to know about the natural phenomenon of human disease which, common though it be, is difficult to define Indeed as will be seen it can only be defined as temporary permanent or progressive alteration in an individual for the worse as judged on human standards Whence it follows accepting this definition for the moment that it is impossible to understand it (seeing that alteration in a thing cannot be understood unless it is known what it was like before it altered) without a working concept, in so far as human experience and science can provide it, of the so called normal man For it is he who at any moment may, as it is said, get ill or develop his disease A working concept of the potential human patient is wanted at the start

THE POTENTIAL PATIENT

Now Man cannot yet claim to understand, indeed if he ever will understand the nature of Man Much about his body (soma) and mind (psyche) still remains mysterious On the other hand, modern science is revealing more and more about him with the result that certain branches of it are basic to the practice of medicine in the sense that the doctor must possess some knowledge of them if he is to understand ill health and prevent diagnose and treat it in his patients

The human body, like any other animal body is an aggregation

what different pathological processes can do, and how to stop each one doing it, and in terms of the different disorders of function and alterations of structure which they can produce, and how to control and remedy each one of them If the student adopts this method, he will find it much easier to answer a question about either the diagnosis or treatment of a disease in a written paper and much easier to diagnose and treat disease in his patients True that it involves more thought on his part But it will enormously reduce the factual information that he must commit to memory and, even more important, will lead him to a much clearer understanding of his patients

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the development of the body in general and of the brain in particular Now there is no necessity to try to define consciousness We all know from our own experience what it is like and what it is like to lose it as in sleep and under an anaesthetic On the other hand, it remains profoundly mysterious and science does not even attempt to explain it Even if one grants the mystery of it, however, and concedes that it is dependent on a functional brain, the development of the individual mind (there is no necessity to define mind either because we all have minds) must depend *in part* on two factors with which science can reckon at least to some extent

In the first place, just as every man must inherit the capacity to develop all the ordinary mental characteristics of the human race (the capacity to feel pleasure and suffer pain, instinct emotion, intellect and possibly a sense of right and wrong) through the genetic plan for his brain laid at his conception (it is impossible to conceive of their inheritance in any other way), so it must be through that plan, and the brain that results from it, that he is born with or without the potential capacity to develop some particular attribute of mind Indeed just as the genetic plan largely determines the body which decides whether a man *can* become an athlete, so it largely determines his brain which as part of his body must decide whether he *can* become a first class intellect In the second place the development of the mind clearly also depends in part on the conscious experience through which the individual passes in growing up and particularly on the circumstances of his early individual life which are largely determined by his home and parents and that organized kind of experience which is called education But just as it is not merely genetic plan and physical environment *adding up* to determine the development of the body but complex *interaction* between them so it is not merely the machinery of the brain and conscious experience adding up to determine the development of the mind Rather, the kind of brain with which a child is born conditions, i e in part determines its reactions to conscious experience and it is these reactions which build up personality

An analogy will perhaps help to make this concept clearer The surface of a wall is bound to condition the appearance of anyone s writing on it Two different surfaces could make the

of cells differentiated into tissues and organs It lives by converting food into heat, that maintains it at constant temperature, and movement, that enables it to perform mechanical work So, from the point of view of thermodynamics, it is a machine, like a steam or internal combustion engine But it is a remarkable machine Not only is it self regulating and self maintaining, if kept supplied with food, but it is also largely self repairing, when damaged, and self reproducing, when mated Most mysterious of all it permits, through the structure and function of its brain, of that awareness of a man's self, his surroundings and other people which is called consciousness

Every human being is the result of a plan engendered at conception when male and female gametes meet, development starting immediately if physical conditions are favourable and the necessary chemical substances available The former normally prevail *in utero* The latter are supplied through its potential mother s blood So, nine months later, when a child is born the execution of the plan laid at its conception is well under way, and now continues in the less constant environment of the outside world, the child getting its building materials through its own processes of digestion, absorption and metabolism Indeed, physical development is not complete until round about the age of twenty and the mind continues developing under the stimulus of experience much longer

The individual human body must therefore be regarded as the product of *protracted* interaction between a plan laid at its conception and the environment, ante natal and post natal, in which development takes place this plan conditioning it normally in the right direction Further, it must be through this plan, that is to say the pattern of genes in the fertilized ovum, that every individual derives his sex and blood group, and inherits all the ordinary characteristics of the human and his own particular race and some of the peculiarities of his ancestors Through it, too, originate some of the characteristics peculiarly his own

The nature and origin of the mind is a more difficult question and science is less exact in its answer One thing does seem certain The development of it depends on consciousness which must dawn at or soon after birth (whether the infant becomes conscious *in utero* is doubtful), and that in its turn depends on

us, convinced that within limits we are free to control our thoughts and actions "All the evidence is against it (free will)," said Dr Samuel Johnson, "all human experience for it' Further, aesthetic taste is difficult to explain away merely on a subjective basis, i e entirely in terms of the changing taste of generations and moral sense difficult to explain away merely in terms of its survival value in the struggle for existence In medicine are we really to deny absolute standards of right and wrong or to refuse to believe that a patient can make an effort of his own to adapt himself to the circumstances of his life or rise superior to the handicaps which disease has imposed on his body?

So the only attitude to adopt to the problem in practice today is to regard the individual human mind and its reactions as having been determined and being determined not merely by interaction between genetic factors (which cannot be altered) and environmental ones past or present (unalterable or difficult to alter) but also at least in part by interaction with a third factor of which science cannot take account It is to this unknown factor in human personality that the doctor appeals when he exhorts his patient to rise superior to some disability or tries to persuade him to adopt a more moral attitude to life Further it may be through it that religious faith sometimes seems to have a profound effect on the material body, allowing it to withstand great pain and privation and react to adversity in a sometimes unexpected manner

PRIMARY FUNCTIONAL DISORDERS

Now no two people are ever quite the same in body mind for the simple reason that no two men or women (with the exception of identical twins) are derived from an identical pattern of genes, and that no two men or women (identical twins included) have ever grown up in quite the same mental or physical environment So there can be no absolute standard of physical or mental normality Further most people are constitutionally weak in some attribute of body mind The superman in one direction the athlete the genius, the man of action, is often a sub man in some other People of this kind when they complain of symptoms are said to be suffering from primary functional

same 'hand" look very different, or force two different 'hands into nearly the same pattern So too with brain (wall) and conscious experience (writing) The mind (psyche) develops on the body (soma) as the result of conscious experience, but this development is conditioned by the physico chemical machinery of the brain which is part of that body Thus the same experience may affect two children quite differently, or different experience force two different children into much the same pattern of behaviour

So, instead of talking about body *and* mind, as if they were entirely separate (when clearly they are not), it is nearer the truth to talk about body *hyphen* mind, which implies and emphasizes their intimate relationship This concept accords better with the facts Alter the body, and the mind alters, as for example, when disease interferes with physical function the doctor gives his patient drugs, or the surgeon operates on the brain with his knife There is no escape from that fact, and practical medicine is forced to take account of it Further that the mind can influence the development of the body in childhood seems likely and although the evidence is less convincing alteration of mental outlook effected through the mind in adult life by experience or psychotherapy may well lead to change in the body and possibly to increased or decreased resistance to the risks to which Man is exposed

On the other hand, it would be quite unjustifiable to claim that the mind can be explained, or indeed to claim that it ever will be explained, *entirely* in terms of interaction between the brain that a man gets as part of his body and the kind of conscious experience through which he passes as he grows up Rather human experience down the ages teaches that there is far more to the individual human mind than that Consciousness permitting pain (of which there seems too much) and pleasure (of which for most people there seems too little), remains mysterious Indeed, what useful purpose in the struggle for existence does consciousness really serve? Would Man have not got on as well perhaps better, if he had remained a reflex machine responding automatically to all forms of stimulation instead of thinking and sometimes acting contrary to his animal nature? For there is not only the problem of pain but also that of free will all of us living, even the most materialistic of

ORGANIC DISEASE

Organic disease stands out in sharp antithesis to primary functional disorders and the differential diagnosis between them is of great practical importance It must be defined as that condition of a person in which temporary permanent or progressive structural change in his body has led, is leading, or is likely to lead, to disturbance of function or as that in which there is some transient or permanent radical alteration in its normal physico chemical machinery without visible structural change

Now this definition may seem a little complicated but it is impossible to define organic disease *merely* in terms of structural change True that post mortem examination usually reveals it But it does not always do so by any means For example no changes can be demonstrated in the body (other than those which are the consequence rather than the cause of dying) of a person who has succumbed to diabetic ketosis or to hydro cyanic acid poisoning The history and more refined methods e g chemical analysis, rather than just looking are required to establish the cause of death in cases like that Not only does structural change, except in cases of physical injury, usually require time to develop but there is no absolute dividing line between structure and function for the simple reason that both depend on the basic physico chemical set up of the body, structure on its more or less static chemistry, function on its rapid chemical reactions such as those, for instance which underlie muscular contraction

In most cases organic disease sooner or later upsets the normal working of the body i e it leads to secondary disorder of function of body or mind So the common use of the word *functional* unqualified by the word *primary* to describe *primary functional disorders* is unfortunate seeing that organic disease leads sooner or later to functional failure or disorder But the use of it in that context has come to stay and it is most import ant to grasp the difference between *primary* functional disorders, often loosely referred to as functional disorders, and functional disorders *secondary* to organic disease In primary functional disorders there is nothing radically wrong with the physico chemical machinery of the body The patient is just functionally

disorders, and are in fact comparable in their particular weakness, to give an analogy, to a cheap as opposed to an expensive make of motor car They cannot get the performance out of themselves which they feel that they have the right to expect Yet there is nothing radically wrong with them It is merely a question of subnormal performance or of regulation of some function not being up to average standard

Some people are constitutionally weak in body in the sense that some aspect of its complex machinery falls below the generally accepted average standard of mankind, for example, the bowels which won t work," the head that will ache" The basic defect may be primarily at the physical level Others are constitutionally weak in mind based on the body or, as some would say, defective in personality, either as the result of the genetic plan whence they are derived, the circumstances under which they grew up, lack of individual effort or some combination of all three of these factors The patient may have a low I Q or be so constituted that he has difficulty for one or more of these reasons in adapting himself to the problems of living in general and to those of his own life in particular Further people of this kind are peculiarly likely to develop bad habits leading to the mixed clinical picture of primary functional disorder *and* organic disease which will be defined below For example, a person with a weak digestion often starts dieting himself and that may lead to malnutrition or iron deficiency anaemia, both organic diseases in the generally accepted sense Another suffering from constipation starts to misuse aperients a condition to be classed under chemical poisoning Further, the constitutionally weak in mind tend to take to drink or drugs, and that is certainly chemical poisoning They may even deliberately injure their own bodies to get what they want or escape from an awkward situation So although, as will be seen primary functional disorders do not seem to lead *directly* to organic disease in the sense, for example, that functional constipation predisposes to carcinoma of the colon, they can predispose *through the mind based on the body* to malnutrition physical injury, chemical poisoning, sensitivity and infection (the five known causes of organic disease) and to many other organic diseases the causes of which are still little understood

individual succumbing to some risk in his environment These risks, to which we are all exposed to some extent in so far as they are known at present, fall into five recognized categories, although no absolute lines of demarcation can be drawn between them—

1 The body not getting enough of one or more of those substances on which its development and maintenance depend namely food, vitamins, certain inorganic substances, oxygen and water

2 Internal strains and external physical injury including over exposure to heat, cold, light and all forms of ionizing radiation

3 Chemical poisons taken for pleasure or with suicidal intent, encountered accidentally in industry or administered in overdose in medical practice

4 The body becoming sensitive to certain chemical substances, often of protein nature, frequently derived from infection and under certain circumstances produced within the body

5 Infection by surface and intestinal parasites and the pathogenic fungi, protozoa, spirochaetes bacteria and viruses

Disease of this kind is clearly acquired as opposed to being genetic, i e born in a person, and as life starts at conception, it can be acquired before birth (for example, a syphilitic mother can infect her unborn child) at birth (for example the foetal brain can be damaged during delivery leading to spastic paraplegia) or at any time after birth as the result of malnutrition, injury, chemical poisoning or infection Disease should therefore be divided *not* into congenital i e born *with*, and acquired after *birth* but into genetic, i e born *in* and acquired after *conception* Sometimes congenital disease is clearly genetic there is a family history or it is of the kind known only to be genetic At other times it has clearly been acquired *in utero* the child s mother had some disease when she was pregnant known to influence development adversely for example german measles But as the genetic plan whence the individual is derived is never known and we know little about the conditions under which the foetus develops, it is usually impossible to say whether a defect with which a child is born,

weak in some particular respect, comparable, to repeat the analogy already used, to a cheap make of motor car (All motor cars work on the same general principle) But in organic disease there *is* some structural change in and/or something radically wrong with or abnormal about, the way in which the body works, leading eventually to secondary functional dis order A cheap make of motor car goes more slowly, is compelled to change gear on hills sooner, and makes more noise than an expensive one of the same age But all its 'symptoms and signs" would be functional" If, however, every ten miles it suddenly stopped, owing to its carburetter getting blocked, or plunged into the ditch owing to a recurrent fault in its steering gear (comparable to a man liable to epileptic fits), a Rolls Royce travelling with it would certainly be justified in saying that its uncertain acquaintance' was the victim of organic disease

THE CAUSES OF ORGANIC DISEASE

Some organic diseases although in point of fact comparatively few, are clearly mainly **genetic** in the sense that they are to be attributed (in so far as genetic can be divorced from environ mental factors in development) to a fault in the plan (the pattern of genes) whence the individual is derived We know that for certain because a number of diseases with clear cut characteristics are handed down from generation to generation according to Mendelian laws for example, haemophilia con genital cystic disease of the kidneys and familial acholuric jaundice Disease of this kind is both genetic *and* inherited Yet it would be a great mistake to suppose that all genetic disease is inherited That is certainly not the case and indeed most is not Mutation of the genes can start a completely new strain of disease, of haemophilia for example Further there is every reason to believe that the pattern of genes in a fertilized ovum which plays so large a part in determining the physical and mental characteristics of the future man and the strength of his constitution must also play a large part in determining the risks in life to which he is likely to succumb and therefore the diseases which he is likely to acquire

Other diseases, on the other hand are clearly **environ mental** in the sense that they are to be attributed to an average

individual succumbing to some risk in his environment These risks, to which we are all exposed to some extent, in so far as they are known at present, fall into five recognized categories, although no absolute lines of demarcation can be drawn between them—

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Die rechtsseitigen Störungen

Im rechten Herzen sind Klappenfehler viel seltener als links Sind solche vorhanden so handelt es sich manchmal um angeborene Vitien oder um Klappeninsuffizienzen infolge allzu starker Überfullung und Erweiterung des rechten Herzens um sogenannte relative Insuffizienzen Nichtsdestoweniger findet der an diesen Sachen Interessierte am Sektionstisch und namentlich im pathologisch anatomischen Museum echte durch endokarditische Prozesse hervorgerufene Klappenfehler die sich in nichts von den linksseitigen unterscheiden Gerade in der letzten Zeit ist das relativ haufige Vorkommen von Trikuspidalstenose mit Verdickung der Klappen und von Pulmonalinsuffizienz infolge starker Überfullung der Art pulmonalis und des rechten Conus arteriosus betont worden

Die dynamischen Folgen der Klappenfehler im rechten sind prinzipiell die gleichen wie die im linken Herzen nur sind sie ganz anders lokalisiert Besteht ein Hindernis Stenose oder hoher Widerstand am Pulmonalostium so wird die rechte Kammer je nach den Verhaltnissen erweitert und hypertrophisch wir sahen dieses letztere schon als unabweisbare Folge der Lungenstauung Wird die rechte Kammermuskulatur geschwacht so wird die Kammer starker gefullt sein infolge der mangelhaften Weiterbeförderung des zufließenden Blutes (Steigen der Menge des Restblutes) Ist das Trikuspidalostium der Sitz des Hindernisses dann wird vor allem der rechte Vorhof der Leidtragende sein und bei starkerer Fullung mehr Arbeit zu leisten haben Und weil hier die Verhaltnisse in der Hauptsache keine anderen sind als die linksseitigen wird sich der Stauweiher auch hier stromaufwarts ausdehnen und sich in den großen zum Herzen fuhrenden Venen anhaufen den Venendruck steigern

Diese Anstauung vor dem Tore des Herzens wo das Blut Einlaß verlangt und nur in beschränkter Menge zugelassen wird hat fur uns den Vorteil daß sie sich leicht nachweisen laßt da der Stauweiher sich gewöhnlich stark auf den Leberkreislauf ausdehnt Daß gerade die Leber so stark und lange vor allen anderen inneren Organen an der Überfullung durch den Stauweiher beteiligt wird findet zunachst eine Erklarung darin daß die beiden Lebervenen in unmittelbarer Nahe des rechten Vorhofs in die unteren Hohladern munden — am nachsten dem Staudamm im Gebiet der starksten Stauung und des höchsten Venendruckes (Siehe Abb 1) Ein zweiter Grund mag sein daß die so außerordentlich gefaßreiche Leber erfahrungsgemäß imstande ist uberraschend große Quantitaten Blutes bis 1 5 Liter und mehr zunachst ohne große Störung ihrer wichtigsten Funktionen in sich aufzunehmen So sehr ist die Lebervergrößerung durch Stauung ein Zeichen der rechtsseitigen Insuffizienz daß wir an dieser Größe den Grad der Stauung und auch den Erfolg unserer Therapie das Abnehmen des Stauungszustandes abschatzen können

Neben den Folgezuständen des Stromhindernis es im rechten Herzen in den stromaufwärts gelegenen Venen dürfen die Folgen stromabwärts im Lungenkreislauf nicht vergessen werden sie sind von einschneidender Bedeutung! Wir sahen schon daß sobald das rechte Herz nicht mehr imstande ist aus welcher Ursache auch das ihm zugeführte Blut optimal weiterzuleiten ceteris paribus die Zufuhr zu den Lungengefäßen entsprechend abnehmen muß Das mag nun natürlich an sich ein Nachteil sein es kann aber auch ein Vorteil daraus erwachsen Diese geringere Zufuhr entlastet den Lungenkreislauf in solchen Fällen von Lungenstauung in welchen vorher das hypertrophierte rechte Herz das ihm zugeführte Blut mit voller Kraft in den Lungenkreislauf geworfen hatte Wie groß und wie wichtig dieser günstige Einfluß der Rechtsinsuffizienz ist werden wir jetzt auseinanderzusetzen haben

Die Rechtsinsuffizienz ein Angelpunkt der kardialen Kreislaufstörung Beim Nachgeben des rechten Herzens wobei das zuströmende Blut nicht mehr aufgearbeitet wird spielen sich jene Vorgänge ab welche am linken Herzen als „Mitralisierung" bezeichnet wurden nur in viel eindrucksvollerer Weise Man kann hier mit Fug von einer „T r i k u s p i d a l i s i e r u n g" der Kreislaufstörung sprechen Zwei Erscheinungen treten dabei in den Vordergrund a) eine dieser Stauung mehr oder weniger entsprechende Verringerung der Blutzufuhr zum Lungenkreislauf b) die Bildung eines Stauweihers im kardialen Abschnitt des Vena cava Gebietes und in der Leber

Die Wechselwirkung zwischen Lungenstauung (Dyspnoe) und Leberstauung (epigastrische Beschwerden) Wer aufmerksam und durch längere Zeit — so wie es dem Praktiker möglich ist — seine Mitralpatienten beobachtet und bei der Behandlung vorsichtig vorgeht das heißt den Einfluß seiner Maßnahmen auf subjektives Empfinden und objektive Zeichen genau verfolgt wird dabei Daten in die Hand bekommen welche den vollen Wert experimenteller Arbeit besitzen und die hier zu besprechenden Wechselwirkungen aufs eindringlichste beweisen können

Je stärker die Lungenstauung um so mehr wird sie das rechte Herz mit höherem Widerstand belasten Es wird der Augenblick kommen in welchem das Myokard durch schlechten Stoffwechselzustand durch hinzugekommene Erkrankung oder durch Störung des Pumpmechanismus des Herzens infolge Vorhofflimmerns dieser Aufgabe nicht mehr gewachsen ist Je mehr dies der Fall ist um so ungenügender wird das rechte Herz sich seines Inhaltes stromabwärts entledigen können um so mehr wird die rechte Kammer erweitert und sich der Stauweiher im Cava Lebergebiete füllen **D i e s e r F ü l l u n g p a r a l l e l w i r d a b e r d u r c h g e r i n g e r e B l u t z u f u h r z u r L u n g e d i e s e s O r g a n v o n d e r s c h w e r s t e n Ü b e r f ü l l u n g b e f r e i t w e r d e n** Der Laien

merkt das an einem leichteren Atmen sehr wohl ist sich aber meistens dabei bewußt daß jetzt im Oberbauch ein neues Hindernis aufgetreten ist eine größere Füllung Spannung oder gar Schmerz das ihn auch, aber in anderer Weise, am freien Atmen hindert

In solchen Fällen soll selbstverständlich die Digitalisbehandlung eingreifen das Herz wird dadurch ruhiger die Diurese steigt, die Lebervergrößerung und die dabei vielleicht schon vorhandenen Ödemansätze verschwinden es geht ausgezeichnet bis in so manchem Falle der dankbare Patient zu seiner Enttäuschung bemerkt daß seine Kurzatmigkeit vielleicht sogar in der Form nächtlicher Anfälle wieder zurückgekehrt ist So findet der Arzt sich veranlaßt die Digitalis auszusetzen Ohne dieses Mittel aber kommt er nicht aus in jedem einzelnen Falle wird er also vorsichtig diejenige Dosis herausfinden müssen welche die Leberschwellung in Schach hält andererseits den Lungenkreislauf nicht zu sehr belastet Das Ziel dieser Behandlung ist also eine Art Gleichgewicht zwischen beiden Stauungsgebieten aufrechtzuerhalten Begreiflicherweise ist diese Aufgabe da am schwierigsten und am wenigsten aussichtsreich wo ein bleibendes nicht besiegbares Strömungshindernis im linken Herzen vorhanden ist wie schweres Myokardleiden oder eine Mitralstenose weil dabei das gestaute Lungenblut unter keiner Bedingung genügend abfließen kann (Siehe Fall 1 und 2 S 20 21) Bei der Mitralinsuffizienz sind die Erfolge der Behandlung viel besser denn die wieder hergestellte Tätigkeit der linken Kammer ermöglicht es den Stauweiher in der Lunge auszuschöpfen und mehr Blut in die Aorta zu werfen

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tigen Niveau zu erhalten. Höchstens ließe sich Hypostase in den unteren Partien der Lunge in dieser Weise erklären.

Die Wechselwirkung zwischen Leber- und Nierenstauung. Zweifellos ist das Auftreten von kardialer Leberstauung ein außerordentlich ungünstiges Zeichen. Bei primärer linksseitiger Erkrankung zeigt es die nunmehr hinzugekommene Insuffizienz des rechten Herzens an, und auch bei primärem Versagen des rechten Herzens ist es das Warnungssignal, das den Patienten zum Arzt führt und diesen zum Ergreifen energischer Maßnahmen zwingt. Die ungenügende Ausschöpfung des dem Herzen zugeführten Blutes gefährdet durch Überfüllung der großen proximalen Venen den ganzen peripheren Kreislauf und die Funktion aller Organe. Auch da, wo das Herz infolge anderer Krankheitsprozesse (z. B. Infektionskrankheiten) geschädigt ist, ist das Erscheinen der Leberstauung ein wichtiges und oft sehr bedenkliches Diagnostikum. Ihr Verschwinden auf Digitalis bestätigt die kardiale Natur der Leberschwellung. Umgekehrt berechtigt uns das Fehlen jeder Lebervergrößerung bei Ödemen an den unteren Extremitäten, welche den Patienten und häufig den Arzt schwer beunruhigen, eine Herzerkrankung auszuschließen.

So unwillkommen also diese Erscheinung sein möge, sahen wir doch schon einen günstigen Umstand in ihrer Folge auftreten, nämlich die Verringerung der Lungenstauung. Ein ebenfalls sehr günstiger Einfluß wirkt sich stromaufwärts im venösen System aus.

Im ebenen Tiefland, wo nur Deiche die großen Flüsse eindämmen, werden bei bedrohlichem Hochwasser dichtbewohnte Gegenden und Städte durch eine einfache Sicherungsmaßnahme vor Überschwemmungsgefahr geschützt. An geeigneten Strecken sind die Deiche absichtlich niedriger gebaut; hier kann das Hochwasser in weniger bewohntes Land abströmen, wodurch sowohl **stromaufwärts** als **stromabwärts** der Hochwasserstand abnimmt. Genau so wirkt die Leberstauung. Auch hier öffnet sich ein Überschwemmungsgebiet, welches den proximalen „Kavatrichter" entlastet und dadurch ein reichlicheres Abfließen von Blut aus den Venen, besonders aus der Vena cava inferior, gestattet. Hierdurch wird auch der hohe Venendruck herabgesetzt. Was das bedeutet, ist leicht einzusehen, wenn man bedenkt, daß die **nächsten großen Venen** stromaufwärts von den venae hepaticae die **Nierenvenen** sind, welche das ganze Blut beider Nieren abführen sollen. Die Folgen der Nierenstauung sind hinreichend bekannt; sicherlich ist die Niere nicht ein geeignetes Überschwemmungsgebiet, so wie die Leber! Die Folgen wären natürlich vor allem ungenügende Wasserausscheidung, welche ihrerseits zu Ödemen führen müßte.

Zweifellos ist es vor allem der Stauweiher in der Leber, welcher ermöglicht, daß Kranke bei schwerer Herzinsuffizienz häufig

merkt das an einem leichteren Atmen sehr wohl ist sich aber meistens dabei bewußt daß jetzt im Oberbauch ein neues Hindernis aufgetreten ist eine größere Fullung Spannung oder gar Schmerz das ihn auch aber in anderer Weise am freien Atmen hindert

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besprochen wurde Bei der Kammersystole wird Blut welches schon Einlaß zur Herzkammer gefunden hatte in den Vorhof zurück geworfen also wiederum ein Beispiel von wirklicher Rückstauung Begreiflicherweise werden rechter Vorhof und Kavagebiet dadurch starker gefullt was sich jetzt meistens auch an den Halsvenen bemerkbar macht jedoch fehlt noch der echte einwellige positive oder Kammervenenpuls Dieser tritt erst in dem Augenblick auf in welchem durch das jetzt schon recht bekannte Flimmern die Vorhöfe aufhören als Ganzes und koordiniert zu schlagen

Die Erklarung dieses merkwurdigen Zusammenhanges ist nicht schwer zu geben solange die normale Schlagfolge von Vorhof und Kammer vorhanden ist (bei regelmaßigem Rhythmus) geht die systolische Entleerung des Vorhofs der Kammerkontraktion unmittelbar voran Wird nun infolge Trikuspidalinsuffizienz sofort beim Anfang der Kammersystole Blut in den Vorhof zuruckgeworfen so wird dieses Quantum Blut vor allem vom gerade entleerten rechten Vorhof aufgenommen werden Der Vorhof wird unter Kammerdruck rucklaufig gefullt und eben dadurch viel starker ausgedehnt als bei schließender Klappe So fangt der Vorhof tatsachlich den positiven Kammerpuls ab und verhindert somit daß dieser selbst die stromaufwarts gelegenen Venen erreicht Wenn aber die Vorhofwand nur fibrillare Minimalkontraktionen zustande bringt geht die systolische Entleerung dieser Herzabteilung vollstandig verloren Sie wird ein ununterbrochen uberfulltes Organ das die noch extra rucklaufig hineingeworfene Blutmenge nicht mehr zur eigenen Fullung verwenden kann der Kammerpuls wird nun mit voller Kraft in die Venen hineingetrieben Dann erst kann man die eingipflige Kammervenenwelle in den Halsvenen als positiven Leberpuls in der gestauten Leber beobachten und registrieren Auch ohne Kurvenschreibung läßt sich am Krankenbette dieser Zustand unschwer dadurch erkennen daß 1 ein starkes systolisches Gerausch sich unten am Sternum haufig bis weit auf die Leber auskultieren laßt 2 die Herztätigkeit eine meist sehr schnelle vollständig unregelmaßige Arrhythmie aufweist (das alte Delirium cordis) 3 der positive Venen und Leberpuls eingipfelig ist und infolge des Kammerdruckes starke Stoßkraft besitzt Ein deutlich fühlbarer Leberpuls tritt nur selten bei regelmäßiger Herztätigkeit auf und wenn dann meist in gespaltener zweigipfeliger Form

Unter Einfluß dieser Faktoren werden die Venen und die Leber stark ausgedehnt (Fall 2 u 4 S 21 u 23) sie sind nicht mehr die Behälter von sich anstauenden Blutmengen sondern werden gewissermaßen unter Kammerdruck gestellt Namentlich die Leber leidet darunter die Tatsache daß es gerade bei dieser Form der Herztätigkeit relativ häufig zur Ausbildung eines Aszites kommt ist ebenso auffallend wie das sonst so lange Ausbleiben von Bauch

wassersucht bei bedeutender Leberstauung Es erscheint nicht un wahrscheinlich daß die Blutbahn in der Leber durch das unauf hörliche Hineinschlagen der kraftigen Venenpulswellen derart er weitert und angebohrt wird daß sich der Stauweiher strom aufwarts ausdehnt und das Portalgebiet uberschwemmt

Auch hier ist es besonders die Digitalistherapie welche uns den Beweis der Richtigkeit dieser Vorstellungen liefert Es gilt dies fur die Rechtsinsuffizienz noch starker als fur die linksseitige weil die Größe der Leber ein leicht feststellbares fur jeden zugangliches Maß der Stauung darstellt wahrend die Lungenstauung sich mehr im Körper versteckt und nur indirekt bestimmbar ist Es mögen daher hier einige uberzeugende Beispiele aus dem letzten Jahre kurz mitgeteilt werden sie zeigen die Wirkung der Digitalis in solchen Fallen besonders deutlich und bilden nur eine ganz kleine Auswahl aus einer sehr großen Zahl ahnlich verlaufender Falle

Kasuistik

Fall 1 Br ♀ 33 Jahre Hat ein zwölfjähriges Kind Keine arztliche Anamnese

1920 Akute Pneumonie Herzfehler entdeckt seitdem langsam zunehmende Ödeme

1927 *Herzschwache schon damals als lebensbedrohlich beurteilt*

1928 Schwerer Herpes zoster seitdem heftige Schmerzen an der befallenen linken Brustseite täglich 0 01 Morphium

1929 Zunehmende Stauungen Atem stark erschwert. Schlaf schlecht Wenig Urin wird durch Wochen mit Salyrgan und Novurit entwassert, verträgt Digitalis nicht deshalb nie wirklich digitalisiert

25 VIII 1929 Stat pr vollkommen entkräftet und hilflos Oberkörper sehr mager an der unteren Körperhälfte (Cav inf Gebiet) starkste Ödeme Herz regelmäßig schlagend stark nach links weniger nach rechts vergrößert Starke Mitralinsuffizienz mit offenbar geringerer Stenose Leber gewaltig vergrößert Spur Aszites Trikuspidal klappen stark insuffizient relativ lautes systolisches Gerausch unten am Sternum bis auf die Leber hörbar

Indikation Der Fall schreit nach Digitalis, wie aber es der Patientin einverleiben?

Therapie vorerst Salyrganinjektionen mit Diurese von erst 2000 dann 1500 später wieder bedeutend unter der Wasseraufnahme bis 400 ccm herunter auch größere *Euphyllindosen*

Digitalisversuch vorsichtig mit 0 1 Pulv dig titr zugleich mit Koffein Theobromin nach 7—8 Pulvern eine au gezeichnete Wirkung auf Atmung Puls und Herztöne Nun werden diese Mittel abwechselnd gereicht Salyrgan wirkt jetzt viel besser Diuresen von 3000 und 3000 ccm Gewichtsabnahme von 53 5 auf 48 kg Bei dieser Behandlung ist zwar der Zustand viel ertraglicher geworden jedoch ist alle 10 Tage eine Salyrganinjektion notwendig sofort nachher tritt wieder das Wasserdefizit ein

23 X 1929 Entfernung der Ödeme durch Dränage der beiden Beine (Tr quart) Entfernung von 6 l Wasser wird ausgezeichnet vertragen Pat. fuhlt sich sehr erleichtert Anschließend starkere Digitalisgaben die Leber nimmt jetzt stark ab hingegen wird die Atmung stark erschwert Jetzt und später immer nach 5—6 Digitalisdosen starkes Zunehmen des nie ganz fehlenden Rasselns auf beiden Lungen

Nach monatelanger Behandlung ohne weitere Besserung nach Hause entlassen

Unter strenger Einhaltung der abwechselnden Digitalis Diuretin und Salyrgan Behandlung hält sich der halbwegs erträgliche Zustand auf einem gleichbleibenden Niveau also ein Gleichgewicht jedoch nur künstlich aufrechtzuerhalten Es geht ihr jetzt nach 9 Monaten häuslicher Pflege wider Erwarten nicht schlechter

Epikrise Primär Mitralinsuffizienz und Stenose Offenbar gut kompensiert gewesen (Geburt ohne Herzbeschwerden) Nach Infektionskrankheit Eintreten schwerer Rechtsinsuffizienz mit muskulärer Trikuspidalinsuffizienz stärkster Leberstauung und Ödemen kaum Aszites alles bei regelmäßiger Herztätigkeit Digitalis wirkt in kleineren Dosen ist auch absolut unentbehrlich jedoch nicht imstande auch nicht in Kombination mit stärksten Diuretizis die allgemeine Stauung zu überwinden Bei nur etwas zu viel Digitalis stärkere Lungenstauung infolge der alten Mitralstenose und der besseren Funktion des rechten Herzens demzufolge Dyspnoe Rasseln auch nach bedeutender chirurgischer Entwässerung und Leberverkleinerung Resultat der Behandlung das Eintreten eines künstlich erhaltenen Gleichgewichtes zwischen rechts und linksseitiger Herzinsuffizienz

Fall 2 Pf ♂ 61 Jahre Drechsler

War immer gesund seit 20 Jahren nach Phlebitis etwas Schwellung am linken Bein 1918 Strumektomie Seit 1 Jahr geht ihm beim Gehen der Atem aus Hat deswegen jetzt einige Monate kein Fleisch gegessen(!) was ihm aber nicht hilft Hatte im Kriege von 79 auf 57 kg abgenommen wiegt jetzt 87 kg

9 IX 1929 Stat pr Zyanose über dem ganzen Körper Herz beiderseits stark vergrößert keine Geräusche jedoch Vorhofflimmern mit Kammerfrequenz von über 150 p m im Liegen Im dicken Bauche wölbt sich eine sehr große Stauungsleber hervor die auch das rechte Zwerchfell in die Höhe drängt kein Aszites Blutdruck 170/100 mm Hg

Diagnose Beiderseitige Herzinsuffizienz bei oder vielmehr infolge von Vorhofflimmern und Hypertonie Leberstauung

Ambulatorische Behandlung Digit 0 1 Chinin 0 15 Strychnin 0 00075 erst 3 dann 2mal täglich

17 IX 1929 Hat sehr wenig getrunken viel Urin gehabt 6 kg verloren In den letzten Tagen Digitalis im Magen schlecht vertragen aber doch genommen Herz viel kleiner Frequenz 80 p m Puls klein weich Leber nicht mehr vorwölbend Zyanose geringer Blutdruck 158/90 mm Hg Vorschrift abwechselnd 1 Tag 3 Digitalispulver wie oben 2 Tage Koffein Theobromin u w

2 IX 1929 Er fühlt sich erstaunlich gut Appetit besser Atem 1 im Gehen gut Schlaf sehr gut Das Herz ist von normaler Größe schlägt regelmäßig im Sinusrhythmus nur noch häufige Vorhofextrasystolen Leberschwellung verschwunden Blutdruck 150/84 mm Jetzt abwechselnd 1 Tag 3 Digitalis + Chinin Strychnin (gegen die Extrasystolen) 2 Tage Koffein Theobromin

2 XII 1929 Fühlt sich völlig geheilt kann 1 Stunde gehen und auch ruhig Stiegen steigen Herz vollkommen regulär 68 Schläge Seit einer Woche keine Pulver genommen Blutdruck 150/78 mm Er wird noch lange Zeit jeden dritten Tag 2 Pulver nehmen damit Extrasystolen und Flimmern möglichst ausbleiben

Epikrise Vorhofflimmern als Ursache der Herzerweiterung unter Zeichen schwerer Rechtsinsuffizienz (Störung durch

Wegfall der Vorhofkontraktion und durch allzu hohe und unregelmäßige Kammerfrequenz) Leberstauung mit ungenügender Diurese Entflimmerung durch Digitalis Chinin Neben der Digitalis verdankt er letzterem Umstande die vollkommene Ausschöpfung seiner Leberstauung und die wiederhergestellte Leistungsfähigkeit

Fall 3 Mi ♂ 54 Jahre

Anamnese Früher immer gesund nur Arrhythmie bei Aufregung Seit 1 Jahr zunehmende Beschwerden Ließ sich nicht behandeln auch nicht als M Basedow festgestellt wurde Suchte später und fand auch Besserung in Schmecks (Tatra) 5 kg zugenommen Bei Wiederholung des Besuches dort starke Atemnot und Beklemmung (durch die Höhe?) Trotz Euphyllin keine Besserung In Wien wurde starke Zyanose und schweres Cheyne Stokessches Atmen festgestellt (Prof H Elias)

14 V 1929 Stat pr Stark kurzatmig Dunkle Zyanose über dem ganzen Körper Herz bedeutend vergrößert systolische Geräusche Vorhofflimmern mit Kammerfrequenz über 180 p m Puls minimal Leber sehr groß und hart Spur Aszites Rechts Pleuraerguß Kropf sehr groß vielleicht dadurch auffallend starke Zyanose an der oberen Körperhälfte (Druck auf Vena cava sup ?) Grundumsatz + 47 /

Diagnose Basedow mit (wohl zweifellos dadurch verursachtem) Vorhofflimmern beiderseitige Herzinsuffizienz Cheyne Stokes

Behandlung Digitalis dringend angezeigt größere Dosen anfangs 0 6 g der titrierten Blätter täglich

21 V 1929 Bedeutende Besserung große Diurese auch durch Euphyllin Osmon Injektionen Vorhofflimmern weg Normalrhythmus von 112 p m Die Temperatur ist erhöht Linksseitiger Lungeninfarkt mit geringem blutigen Sputum Herz noch sehr groß nur rechts kleiner noch starke Zyanose aber nur in der unteren Körperhälfte eigentlich nur im Abflußgebiet der Vena cava inf Die horizontal verlaufende Wasserscheide zwischen den Strömungsgebieten der Vena cava superior und inferior zeichnet sich deutlich ab (Seite 34) Noch Verdacht auf etwas Aszites auch noch leichtes allgemein verteiltes Ödem (Frage aufgeworfen ob nicht noch andere als nur kardiale Stauung allein dahintersteckt Leberzirrhose oder adhäsive Perikarditis?)

Vorschrift Abwechselnd Digitalis und Euphyllin Osmon

27 V 1929 Weitere Besserung stark entwässert das Herz etwas kleiner Frequenz 68 regulär der Pleuraerguß rechts verschwunden links noch Infarktreste Kaum noch Zyanose die Leber fühlt sich normal an Aszites weg Hat dabei wieder etwas Beklemmung auf der Brust bekommen daher weniger Digitalis verschrieben Grundumsatz noch + 40% Elektrokardiogramm T Zacke in II und III leicht negativ (leichter Myokardschaden?) Röntgenbestrahlung des Kropfes angeordnet

Von dieser Zeit an gleichmäßig fortschreitende Besserung bis er endlich am 29 XI erklärt er habe sich nie im Leben so wohl gefühlt Das Herz arbeitet normal keine Spur von Leberschwellung die Lungen haben sich gereinigt Zwar hat er noch einen leichten Tremor sonst keinerlei Basedowische Erscheinungen Ekg ist jetzt vollständig normal ebenso der Grundumsatz Leistungsfähigkeit sehr befriedigend

Epikrise Hinter der Herzinsuffizienz steckt offenbar eine Hyperthyreose welche auf dem Wege des Vorhofflimmerns (sehr häufig bei dieser Krankheit) und wahrscheinlich auch durch Herzmuskel-

intoxikation (Ekg vor der Bestrahlung abnormal später gut) eine Herzinsuffizienz hervorrief. Der Verdacht auf Leberzirrhose oder Perikarditis verschwand beim günstigen Verlauf. Hauptpunkte: die sehr hohe Kammerfrequenz (± 180) mit äußerst schlechter Füllung des arteriellen Systems (Cheyne-Stokes) und starker Leberstauung mit verminderter Diurese und Ödemen. Der vollständige Erfolg von Digitalis und Diuretika weist auf den rein kardialen Ursprung dieser Erscheinungen, blieb jedoch erst nach Bestrahlung des Kropfes endgültig bestehen.

Fall 4. S. ♂ 62 Jahre. Gutsverwalter aus Ungarn.

Immer gesund gelebt. In der letzten Zeit schlichen sich Beschwerden ein, die immer störender werden: Beklemmungen beim Gehen und Treppensteigen, schnauft dabei nicht, muß nur stehen bleiben und einigemal tief atmen. Hat sehr angestrengt geistig gearbeitet.

16. V. 1929. Stat. pr. Aussehen nicht schlecht. Herz hochgedrängt, sehr breite Dämpfung auch über der Aorta (s. Orthodiagramm), laute Aortentöne, sehr starkes systol. Trikuspidalgeräusch. Vorhofflimmern mit durch Extrasystolen sehr unregelmäßiger Kammertätigkeit von geringer Frequenz (ca. 60 p. m.). Blutdruck 190 mm Hg. Die Leber ist maximal vergrößert, positiver Leberpuls, besonders stark in dem stark sich vorwölbenden linken Lappen. WaR. —

Diagnose: Starke beiderseitige Herzinsuffizienz bei art. Hypertonie und wahrscheinlich schwerer Aortensklerose.

Behandlung: Digitalisbehandlung trotz Bradykardie und Hypertonie unter ständiger Beobachtung dringend notwendig. Da er einstweilen nicht nach Wien kommen kann, vorläufig für zu Hause leichte Digitaliskur verschrieben, abwechselnd 1 Tag Dig. 0,1, Chinin 0,2, Papaverin 0,04 dreimal. Zweiten Tag 2×2 Kalz. Diuretin-Tabletten usw.

21. VI. 1929. Aufnahme im Sanatorium. Nach den ersten 8 Pillen hat Pat. sich wie ausgetauscht gefühlt, sieht sehr gut aus. Herz noch sehr groß. Leber so umfangreich und hart, daß man an andere Lebererkrankungen (Zirrhosis?) denken muß. Auch noch etwas Aszites. Geringe Fußödeme. Ekg: Vorhofflimmern, sehr langsame Kammeraktion, sogar unter 50, jedoch mit vielen Extrasystolen. T nur in I positiv. Es wird Myokardschaden für wahrscheinlich gehalten. Urin: S. G. 1016—1023. Spuren Albumen, schläft noch sehr schlecht. Appetit aber gut.

Indikation: Vorläufig keine Digitalis wegen hochgradiger Bradykardie. Salyrgan!

26. VI. 1929. Auf Salyrgan + 2 kg verloren, fühlt sich viel besser, jedoch sofort nach dem Salyrgantag immer wieder Wasserdefizit. Die Leber ist etwas weicher, der Aszites verschwunden.

1. VII. 1929. 10 Tage wurde die Diuresetherapie fortgesetzt ohne weitere Erfolge. Die Leber ist noch gewaltig groß, der harte linke Lappen ragt, nachdem die übrigen Teile weicher und etwas kleiner geworden sind, wie ein Felsen unterhalb des Schwertfortsatzes hervor. In diesen schießt offenbar der starke Leberpuls (infolge Trikuspidalinsuffizienz und Vorhofflimmern!) hinein, der hier am stärksten fühl- und hörbar ist. Pat. nennt diese Stelle sein „Gibraltar“ und ich rate im Scherz, Moses herbeizurufen, damit er mit seinem Stabe Wasser aus diesem Felsen entspringen lasse. Die einzige Möglichkeit zu diesem Kunststück schien starke Digitalisierung zu sein, damit das rechte Herz sich besser entleere, dadurch kleiner werde und es vielleicht gelingen könnte, die Trikuspidalklappe mehr oder weniger zum Verschluß zu bringen. Der Versuch wird trotz Bradykardie von unter 60 p. m. unter größter Vorsicht durch

gefuhrt und zwar wird die Einzeldosis von 0 1 Dig mit 0 15 Coff natr sal und 0 2 Theobromin pur dreimal taglich kombiniert Schon nach 24 Stunden ist die Diurese von 800 auf 1310 gestiegen! Pat fuhlt sich erleichtert und sieht mit Staunen wie von jetzt an die Wasser strömen! Nach 8 Tagen innerhalb welcher schon einige digitalisfreie Tage eingeschaltet wurden bleibt die Diurese überschüssig und hat er 5—6 kg abgenommen Die Ödeme das Trikuspidalgeräusch und der positive Leberpuls sind verschwunden der Felsen ist weggeschmolzen Die verkleinerte Leber ist abgerutscht oberhalb *der Leber ist die Bauchwand wo vorher* der linke Leberlappen hervorragte eingefallen was der Pat so ausdruckt daß jetzt viel Platz in seiner Wohnung vorhanden ist Die Kammerfrequenz war von 50 auf 64 gestiegen! Auch war das Herz perkutorisch sehr bedeutend kleiner geworden Die orthodiagraphischen Zahlen sind in Abb 3 ersichtlich

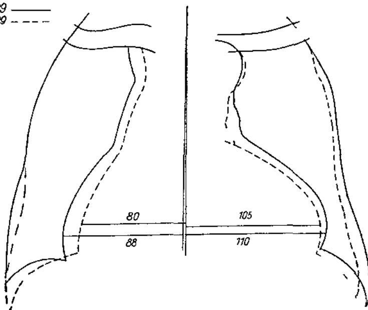


Abb 3 Einfluß der Behandlung auf das Orthodiagramm in Fall 4

Der Erfolg war nur durch die Digitaliswirkung erreicht worden. Es handelte sich offenbar nicht um andere Lebererkrankungen sondern um rein kardiale Stauung infolge starker Erweiterung des rechten Herzens und Trikuspidalinsuffizienz Merkwurdigerweise *erwies sich dieser Erfolg als dauerhaft* Mit 1 Tag Digitalis 1 Tag Koffein mit Theobromin und 1 medikamentenfreien Tag abwechselnd blieb das Wassergleichgewicht tadellos erhalten und Pat fuhlte sich vollständig erlöst und arbeitsfähig Noch eine recht beweiskraftige Episode folgte wie leider noch allgemein angenommen wird soll der Mensch nicht immer Digitalis nehmen (besonders wenn er Bradykardie zeigt!) Weil aber das Mittel nur jeden 3 Tag genommen wurde war hier ein fortwährendes Nehmen gar nicht vorhanden Nichts

destoweniger wurde es ihm vom behandelnden Arzt wegen Arrhythmie des Herzens (die schon immer da war) gestrichen Der Pat der seinen irdischen Tempel nicht weniger sorgfältig verwaltete als die ihm anvertraute fürstliche Domäne führte die ganze Zeit die genauesten klinischen Tabellen über Medikation Diurese und Gewicht Er bemerkte nun sofort nach dem *Einstellen der Digitalis* ein Nachlassen der täglichen Diurese um 100—150 ccm die Atmung wurde etwas kürzer Nach 6 Wochen dieser digitalislosen Behandlung kam er nach Wien wo große Leberschwellung und deutliche Ödeme an den Beinen festgestellt wurden. **Auf die ersten Digitalisdosen folgte dann sofort ein Überschuß von 300—400 ccm Harn** und eine ab sichtlich erst dann durchgeführte Salyrganinjektion warf das restliche retinierte Wasser mit Schwung aus den Geweben heraus Pat blieb ödem und beschwerdefrei und fühlte sich vollkommen wohl **Der Blutdruck hielt sich auf ca. 175 mm Hg** Am 5 Januar 1930 starb er plötzlich wahrscheinlich an Apoplexia cerebri was bei seiner schweren Arteriosklerose und seiner erweiterten Aorta nicht allzusehr verwundern kann

Epikrise Schweres arterielles Leiden nicht luetischer Natur Infolge Vorhofflimmerns starke Erweiterung des rechten Herzens mit großer Trikuspidalinsuffizienz Enorme Stauungsleber Ödeme Spur Aszites keine Lungen keine Nierenerkrankung Die starksten Diuretika blieben nur teilweise wirksam erst relativ kraftige Digitalistherapie brachte die wirkliche Erlösung und blieb auch bis zum Ende die unentbehrliche Therapie

Ähnliche Fälle können von jedem Arzte gesammelt werden sie bringen den experimentellen Beweis für die hier vorgebrachten und eigentlich längst allgemein angenommenen — aber wieder vergessenen — Anschauungen über die einfache mechanische Genese der verschiedenen Formen der Kreislaufstörungen und ihrer Wechselwirkungen Sie werden auch bei den späteren Besprechungen gute Dienste leisten Auch zeigen sie die ungeheuere Bedeutung der rechtsseitigen Herzinsuffizienz und ihrer Folgezustände

Die kardialen Stauungen und Ödeme gehorchen den Gesetzen der Schwerkraft Die kardialen Stauungen in den Venen machen sich im großen Kreislauf am starksten in den untersten Teilen des Körpers bemerkbar Je weiter unterhalb der Eintrittspforte des rechten Herzens um so beschwerlicher ist der dem Blut vorgeschriebene Weg Wahrscheinlich wirkt in chronischen Fällen die bedeutende Erweiterung der Venen auch dadurch schädlich daß wie bekanntlich bei Varizen am Bein die Venenklappen nicht mehr schließen also die ganze nirgendwo mehr unterstützte Blutsäule auf dem peripheren Kreislauf in den untersten Partien ruht Infolgedessen sind auch bei starker Stauung die Halsvenen im allgemeinen (es gibt Ausnahmen!) wenig gefüllt Legt der Patient sich nieder so scheint der Inhalt der großen Venen so wie der Wein in einer halb gefüllten horizontal gehaltenen Flasche sofort in den Hals hinein zu fließen **Wahrscheinlich spielt das jetzt in den horizontalen Venen nicht mehr so starke Abfließen des Blutes aus dem Kopfe z**

Herzen bei dieser Fullung mit eine Hauptrolle Übrigens kann der gleiche Vorgang beim gesunden Menschen beobachtet werden Beim Venenpulsschreiben muß man meistens die Versuchsperson mit horizontalem Oberkörper liegen lassen bevor die Halsvenen genugend gefullt sind um die von der Herztatigkeit her ruhrenden Fullungsschwankungen mit dem Aufnahmetrichter zu registrieren *Bei rechtsseitiger Insuffizienz fließt* aber in dieser Lage so viel Blut aus der unteren Körperhalfte und außerdem aus dem Stauweiher in Leber und unterer Vena cava zum Herzen daß auch die Vena cava superior prall gefullt wird so prall daß die pulsatorischen Fullungsschwankungen nicht mehr zum Ausdruck kommen Diese treten nun erst wieder auf wenn man den Oberkörper des Patienten erhöht wodurch die Stauung im Halse gemindert wird

Diese sicht und schreibbaren Venensymptome zeigen die durch die horizontale Lage erhöhte Blutzufuhr die größere Fullung und den höheren Druck im proximalen Kavagebiet deutlich an diese Faktoren sind auch zweifellos eine Hauptursache bei der Atemnot im Liegen der sogenannten Orthopnoe (Siehe S 112) Wie sollte die Menge und der Druck dieses aus den Venen getriebenen zuströmenden Blutes nicht eine gewaltige Mehrbelastung des rechten Herzens darstellen? Der Patient halt diese Lage und die Überfullung des Herzens nicht aus glaubt zu ersticken und richtet sich mit Gewalt auf genugt das Im Bette Sitzen nicht so wirft er die Beine uber die Bettkante und kann jetzt bei hangenden Beinen und entlastetem rechten Herzen und Lungenkreislauf den zwingenden Lufthunger nach und nach befriedigen Wie sehr wir es hier mit einer durch die Schwerkraft ausgelösten mechanischen Überfullung zu tun haben beweist der Versuch den Neigungswinkel der Ruckenlehne des Patienten in den verschiedenen Stadien der therapeutischen Besserung zu messen (Elias *8*) Die Atemstörung geht parallel mit dem Neigungswinkel jede Verschlechterung verlangt höhere Lage was man mittels eines Gradbogens an der Ruckenlehne genau bestimmen kann Elias beobachtete auch daß in einer bestimmten Lage Dyspnoe nicht eintritt sobald aber der bis jetzt hochgehaltene Kopf des Patienten auf das Polster zurucksinkt wird die Lage nicht vertragen Er halt *es fur wahrscheinlich daß hierbei auch eine starkere Stauung im* Atemzentrum mitspielt weil sobald man den Kopf des Patienten wieder in höherer Lage unterstutzt die Dyspnoe ertraglicher ist (S 112)

Diese Beteiligung des Atemzentrums an der Genese der verschiedenen Formen der Dyspnoe soll uns davon zuruckhalten die venösen Stauungen im Großkreislauf als einzige Ursache der Orthopnoe zu betrachten Es gibt auch nicht gestaute Patienten die Orthopnoe zeigen doch bietet die haufigste hier beschriebene Form wohl am ehesten einen augenfalligen Zusammenhang mit der Stauung des Vena cava Gebietes und der Leber

Die kardialen Ödeme folgen der Lokalisation der venösen Stauung sehr genau Das erscheint nicht verwunderlich wenn auch Ödemarten verschiedenster Entstehungsart vorkommen so ist es doch unmöglich die kausale Beziehung der Stauung zum Ödem zu vernachlässigen oder gar abzulehnen Ob es sich bei dieser Beziehung um ein Durchgepreßtwerden von Blutflüssigkeit ins Gewebe oder nur um eine Hemmung der Entlastung des Gewebswassers in die unter hohem Druck stehenden uberfullten Kapillaren handelt oder ob es eine Gewebsschadigung ist welche immerhin wohl von dem gestauten Kreislauf herruhren kann jedenfalls ist die lokale Beziehung da (Siehe unter Wasserwechsel S 76) Wo in der Peripherie die starkste Stauung die geringste Blutströmungsgeschwindigkeit ist dort sind auch die größten Ödeme Die freie Beweglichkeit der Ödeme unter der Haut wird auf die Dauer eine sehr große und entspricht auch der Beweglichkeit des Stauweihers in den Venen Jedem Arzte sind die seit langem gestauten Patienten bekannt bei denen bei gezwungener ruhiger Bettlage oder in der sitzenden Haltung die Ödeme im Körper eine horizontale obere Begrenzung aufweisen Im Körper des halbsitzenden Patienten bildet sich nicht nur von hoch oben im Rucken bis vorne unten am Bauch ein Ödemwall auch an den Armen sind die unter diesem Niveau befindlichen Teile z B an den Ellenbogen stark geschwollen Auch wenn man schon haufig in solchen Fallen die unteren Extremitaten punktiert hat ist man immer wieder erstaunt zu beobachten wie beim Abfließen die obere Abgrenzung des Ödems sich wie beim Abzapfen eines Fasses horizontal senkt die Unterschenkel und Fuße am langsten geschwollen bleiben

Der perikardiale Stauungstypus

Wenn auch genau genommen die Perikarditis ein extrakardialer Prozeß ist so wirkt sie sich so sehr unmittelbar am Herzen aus daß man sie in der Reihe der kardialen Kreislaufstörungen unterbringen darf Sie ruft Stauungen ungewöhnlicher Schwere und von besonderem Typus hervor was sowohl fur die adhasive wie fur die exsudative Form gilt

Die adhasive Form hat zuerst durch ihre merkwurdigen und nicht eben leicht erklarlichen Erscheinungen die Aufmerksamkeit auf sich gelenkt Sie sind 1 eine gewaltige Leberstauung die schon in ganz fruhen Stadien auftritt 2 die Neigung zur Aszitesbildung und 3 die starke Beteiligung des oberen Kavagebietes Kurz gefaßt handelt es sich hier nicht nur um eine einfache Verklebung und Verwachsung der Perikardblatter in der Art wie wir sie nach geheilter seröser Pleuritis an der Pleura finden sondern um schwartenartige feste Verwachsung des Herzens mit dem Herzbeutel und den diesen umgebenden Organen Pleuren und Lungen Zwerchfell und mediastinalen Gebilden Das Herz

verliert seine freie Beweglichkeit die Schwarten widersetzen sich sowohl der systolischen Verkleinerung als der diastolischen Erweiterung Das Schlagvolumen nimmt stark ab und vielleicht ist es die ärgste Störung daß das Herz nicht mehr imstande ist bei höherer Beanspruchung eine größere Menge Blut in sich aufzunehmen Dieses unverrückbare Hindernis ruft natürlich eine sehr starke Stauung unmittelbar vor dem Eingang zum Herzen hervor Der Staudamm wird dabei durch einen besonderen Umstand um eine kleine Strecke mehr stromaufwärts verlegt Die das Herz einhüllenden Schwarten verengern die ab und zuführenden Gefäßstämme an der Stelle wo sie durch das Perikard treten Es werden dadurch Vena cava inferior und superior sowie die Lungenvenen getroffen und sogar an den großen Arterienstämmen können bedeutende Verengerungen vorkommen

Zu den weiteren Schädlichkeiten bei diesem Zustand gehört die starke Hemmung der Atembewegung infolge der inneren Verwachsungen deren Mittelpunkt das Herz ist Die in entgegengesetzter Richtung wirkenden Bewegungsversuche von Thorax und Zwerchfell zerren das Herz noch mehr in die Enge das Schlagvolumen wird bei der Atmung kleiner (*Pulsus paradoxus mechanicus*) So wird die kreislauffördernde Wirkung der Atmung und namentlich die inspiratorische abdominelle Entleerung in der Richtung des Herzens in einen schädlichen Mechanismus umgesetzt Wahrscheinlich ist dies einer der Gründe für die ungewöhnlich starke Leberschwellung

Einen in seiner Auswirkung gleich bedenklichen Mechanismus findet man bei größeren Ergüssen im *Herzbeutel* Bekannt ist die Art in welcher dabei das Herz durch den Druck des Exsudates „tamponiert" wird Wie vollkommen richtig dieser Ausdruck ist haben Elias und Feller (8) in ihrer bekannten Arbeit über diesen Gegenstand ins Licht gestellt Die Vorhöfe werden dabei in sich selbst eingestülpt Rechts legt sich die Vorhofwand vor die Einmündung der Vena cava die Abbildung sieht einem Prolaps der Vaginalwand in die Vulva vollkommen ähnlich Dabei muß schließlich jede Füllungsmöglichkeit für das Herz aufhören!

Zu diesen Schwierigkeiten gesellt sich noch eine andere Hemmung Natürlich bildet der hohe Druck im Herzbeutel einen Extrawiderstand für das Einfließen des Blutes aus den Venen Außerdem aber werden die herznahen Gefäße ebenso verengt wie bei der adhäsiven Perikarditis Der Unterschied ist daß hier die weiten Perikardfalten an den Umschlagstellen ins Epikard entfaltet werden und nun infolge des Exsudatdruckes die proximalen Teile der Venen und Arterien zusammendrücken Dadurch wird auch hier die Vena cava superior stark bedrängt und tritt als Folge die Stauung an Oberkörper Hals und Kopf auf Besonders ungünstig aber wirkt diejenige Perikardfalte welche sich unter dem rechten Vorhof zwischen Herz und Dia

phragma und in der Richtung nach hinten tief vordrängt Dabei wird nicht nur die Vena cava inferior stark von vorn nach hinten eingedrückt sondern auch und sogar speziell die Lebervenen Das ist durch die topographisch anatomischen Verhältnisse namentlich durch die Nähe der Einmündungsstelle dieser Venen zum rechten Vorhof bedingt eine sehr unerwünschte mechanische Abflußbehinderung für das Blut aus der Leber und den splanchnischen Gefäßen macht sich dadurch bemerkbar Es mag in diesem Umstande auch wohl der Grund für die relative Häufigkeit des Aszites bei Perikarditis gesehen werden Die Krankheit selbst kann zwar auch eine entzündlich seröse Peritonitis hervorrufen im allgemeinen aber sieht man bei Behandlung des kardialen Hindernisses (Entleerung des Perikards durch Punktion) eine sofortige Besserung der prallen Lebervergrößerung und ein Verschwinden des Aszites als unmittelbare Folge was natürlich *bei exsudativer Peritonitis nicht der Fall* wäre

Kreislaufstörung bei gleichmäßiger Schädigung beider Herzhälften

Bis jetzt wurden fast ausschließlich solche Zustände besprochen in welchen örtliche Schädigungen im Herzen eine Reihe von ebenfalls örtlichen Kreislaufstörungen hervorriefen Es wurde darauf aufmerksam gemacht daß es bei gleichzeitigem Vorhandensein von Rechts und Linksinsuffizienz gelegentlich zu einer Art Ausgleich zu einem Gleichgewicht zwischen beiden Faktoren kommen kann Ein solches Gleichgewicht bleibt aber spontan nicht bestehen es muß immer wieder durch genau dosierte Therapie aufs neue hergestellt werden Gibt es aber nicht auch Zustände in welchen das Herz als Ganzes gleichmäßig von einer dem Herzmuskel schädlichen Ursache getroffen wird und erkrankt also beide Herzhälften in ihrer Leistungsfähigkeit in gleichem Ausmaß herabgesetzt werden? Eine berechtigte Frage wäre dann welche Form von Kreislaufstörung wird dabei auftreten? Die erste Frage muß zweifellos bejahend beantwortet werden *die zweite Frage aber ist vielleicht als solche noch* kaum von anderen Autoren gestellt worden Wie hier die Antwort lauten wird kann einstweilen nur die Beobachtung in einschlägigen Fällen uns lehren Wir werden also vorerst solche Fälle zu suchen haben

Von grob anatomischen Herzkrankheiten ist es vielleicht nur die soeben besprochene adhäsive und exsudative Perikarditis welche das ganze Herz gleichmäßig schädigt (siehe S 27) Die Kreislaufstörung aber macht sich stromaufwärts des rechten Vorhofs bemerkbar weil schon der Eintritt zu diesem Herzteil stark behindert wird Zum Stauweiher im Herzen selbst oder im Lungenkreislauf kann es dadurch nicht in dem Maße kommen Der Typus ist der der rechtsseitigen Herzinsuffizienz

Einen zweiten schon besprochenen beide Herzhälften gleich

maßig treffenden Zustand stellt das Vorhofflimmern dar Die Störung der Pumpwirkung infolge des Ausfalles der Vorhofsystole und der frequenten unregelmaßigen Kammertatigkeit findet in beiden Herzabteilungen in vollkommen gleicher Weise statt Wir sahen aber schon daß auch hier die Kreislaufstörung ganzlich vom rechts seitigen Typus ist mit starker Leberstauung und verringerter Zufuhr zu den Lungen (keine Dyspnoe) (Fall 2 S 21) Auch bei der (regel maßigen) paroxysmalen Tachykardie kann man ahnliche sehr in struktive Beobachtungen machen Das Fehlen der Dyspnoe ist schon langst manchem Beobachter aufgefallen Dauert der Anfall aber sehr lange so entwickelt sich Leberstauung mit starkem Schlagen der Halsvenen nicht Lungenstauung Gelingt es den Anfall wahrend der Beobachtung durch Karotisdruck plötzlich zu kupieren so ver *schwinden das Venenschlagen und die Lebervergrößerung* in aller kurzester Zeit unter unseren Augen*)

Endlich durfte man gleichmaßige Schadigung des ganzen Herzens bei der Einwirkung von Giften auf den Herzmuskel erwarten Na mentlich ware das der Fall bei toxischen Schadigungen Infektions krankheiten usw Tatsachlich ist auch hier haufig die Leberschwellung das böseste Warnungssignal eines versagenden Herzens jedoch spielen hier andere den Kreislauf andernde Faktoren mit welche wie wir unten (Seite 40) sehen werden das Bild verwirren

Geradezu ein Paradigma fur die hier besprochene Frage scheint uns das Herz der akuten Form der Beriberi Krankheit zu liefern (*1*) Hierbei kommt es zu schwersten Herz Kreislaufsym ptomen und zum Herztod Die Ursache der schweren Herzschadigung liegt im Herzmuskel selbst der höchstwahrscheinlich infolge patho logischer Wasserbindung (Quellung) im quergestreiften Muskel seine Kontraktilitat verliert wahrend Reizbildung Reizbarkeit Reizleitung nicht im geringsten gestört sind Das Elektrokardiogramm ist normal ja ubernormal! Die klinische Untersuchung und das Röntgenbild zeigen uberzeugend daß anfangs beide Herzhalften in gleichem Ausmaße betroffen sind und beide sich bedeutend erweitern In den schweren Fallen aber besonders wo der Patient noch keine Lahmung hat und sich noch kraftig bewegen kann nimmt der Umfang des rechten

*) Am 5 Januar 1931 (wahrend der Korrektur dieser Arbeit) kam eine 45 jährige Frau zur Untersuchung welche im November und Dezember 1930 zwei schwere Anfalle von paroxysmaler Tachykardie durchgemacht hat Dabei war beide Male ein schweres direkt bedrohliches Oedema pulmonum aufgetreten Diese unsererseits fruher noch nie beobachtete Komplikation erhielt ihre Erklärung als ein Blutdruck von weit uber 200 mm Hg bei ihr festgestellt wurde Das linke Herz war infolge der extremen Frequenz im Anfall nicht imstande das ihm zugefuhrte Blut zur Ganze zu verarbeiten *Daher die akute Lungenstauung In diesem Falle han*delte es sich also auch nicht um eine gleichmäßige Schädigung beider Herzhälften denn das linke Herz war viel stärker belastet als das rechte

Herzens unverhaltnismaßig zu die rechte Kammer ist uberfullt die Leber schwillt an es kommt zu muskularer Trikuspidalinsuffizienz Leberpuls und maximaler Leberstauung Der Patient stirbt wenn nicht die Vitamin B reiche Diat und eventuell große Aderlasse ihn noch retten Wahrend der Entwicklung dieser sturmischen Erscheinungen bleibt der *Lungenkreislauf ungestaut* trotz riesigen Herz schattens bleibt im Röntgenbild das *Lungenfeld vollstandig hell und ungetrubt* Nach dem Tode findet man ein sehr großes Herz mit scheinbar hypertrophischem wahrscheinlicher gequollenem Herz muskel und als regelmaßigen Befund ein ganz uberwiegend ver größertes rechtes Herz Die linke Herzhalfte ist viel weniger groß die Lungen pramortal ödematisch nicht stark mit Blut gefullt

Die Erklarung dieser auffallenden Tatsache daß bei gleichmaßiger Schadigung der Tatigkeit beider Herzhalften immer nur die Zeichen rechtsseitiger Herzinsuffizienz großes rechtes Herz und Leberstauung bei fehlender Lungenstauung beobachtet werden kann eine ein fache sein

Wenn in einem Herzen die Kraft der Systole infolge einer all gemeinen Herzmuskelerkrankung in beiden Halften in gleichem Maße abnimmt wird fruher oder spater der Augenblick eintreten in welchem *beide* Kammern nicht mehr imstande sind ihren Inhalt in normaler Weise auszutreiben Das Einzelschlagvolumen wird kleiner es bleibt ein Restblut zuruck welches zur Erweiterung des Herzens fuhrt Infolge der Myokarderkrankung kann das Herz darauf nicht mit entsprechend vergrößertem Schlagvolumen reagieren die Herzerweiterung nimmt zu Im Herzen selbst bald auch in den zu fuhrenden Venen wird sich das ankommende Blut anstauen so wie das schon wiederholt besprochen wurde Ist einmal dieses Stadium eingetreten so werden sich die zwei Unterschiede in den Arbeitsbe dingungen der beiden Herzhalften bemerkbar machen die im vorher gehenden immer wieder hervorgehoben wurden Erstens der schwachere Bau des rechten Herzens und der Trikuspidalklappe die mehr als am linken Herzen zur Erweiterung und zur Klappeninsuffizienz dis ponieren Dann auch die Tatsache daß infolge des geringeren Minuten volumens der rechten Kammer dem Lungenkreislauf und dem linken Herzen eine geringere Menge Blut in der Zeiteinheit zugefuhrt wird *Je schlechter das rechte Herz arbeitet um so weniger wird der kleine Kreislauf gefullt um so geringer wird die dem linken Herzen gestellte Aufgabe* Wahrend das rechte Herz vom ganzen zuströmenden Blut belastet wird und unter dieser Burde zusammenbricht bleiben der Lungenkreislauf und das linke Herz bis zum Ende von so starker Überanstrengung Uber fullung und Dilatation verschont

Es wird sich zeigen daß spater zu besprechende Faktoren wie verstarkte Zufuhr zum Herzen und größeres Minutenvolumen in

diesen Zustanden die hier als einfach geschilderten Vorgange bedeutend komplizierter gestalten können die Tatsache bleibt aber bestehen daß die einfachen Gesetzmaßigkeiten des Kreislaufapparates imstande sind die hydrodynamische und statische Basis fur das Geschehende zu liefern

Diese fur die Lehre der Herz und Kreislaufstörungen eigentlich fundamentellen Verhaltnisse fanden vor kurzem in Arbeiten von Hochrein und Eckhardt *(20)* eine recht demonstrative Beleuchtung Mit Hilfe einer allem Anschein nach verlaßlichen Methode hat Hochrein das Inhaltsvolumen, den Fassungsraum der vier Herzabteilungen am Kadaver Nichtherzkranker bestimmt der

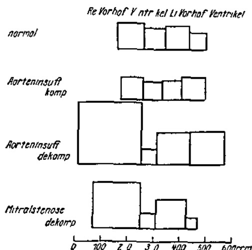


Abb 4 Die Großenverhaltnisse der vier Herzabteilungen bei Klappenfehlern (nach Hochrein u Eckhardt)

rechte Vorhof ist in diastolischer Entfaltung die größte Herzabteilung dann folgen in Reihengröße der linke Vorhof die rechte Kammer und endlich die linke Kammer Die absoluten Werte sind in der oberen Zeichnung von Abb 4 dargetan Es ist schon in der Norm das rechte Herz weiter als das linke das rechte Herz schickt also nur einen Teil seines Inhalts dem linken zu Die auffallende Größe des rechten Vorhofes veranlaßt die genannten Autoren zu der Folgerung daß der rechte Vorhof als der größte aller Herzabschnitte das venöse Blut speichert und wahrend der Diastole nur einen Teil des von ihm gesammelten Blutes an den rechten Ventrikel abgibt '

Betrachtet man nun die Größenverhaltnisse bei Klappenfehlern so entspricht das Schema fur die kompensierte Aorteninsuffizienz insofern den Erwartungen als die linke Kammer gegen die normale

vergrößert ist, daß aber die mehr stromaufwärts gelegenen Abteilungen inklusive des linken Vorhofs in ihrem Verhältnis untereinander unverändert geblieben sind. Das bestätigt unsere Vorstellung, daß linker Vorhof, Lungenkreislauf und Herz nichts von den in der linken Kammer sich abspielenden Vorgängen zu bemerken brauchen (siehe S. 8).

Wird nun, wie oben beschrieben, das linke Herz *insuffizient*, so entleert sich die Kammer nicht mehr genügend und ihre Überfüllung hemmt auch die Zufuhr aus dem linken Vorhof, welcher nun seinerseits stark überfüllt wird. Am auffallendsten aber ist die gewaltige Größe des r e c h t e n Vorhofs, der unserer hier erörterten Vorstellung entsprechend eine Blutmenge faßt, doppelt so groß wie die des linken Vorhofs. Diese so bedeutende Vergrößerung beider Vorhöfe und die Kleinheit des rechten Ventrikels legen die Annahme nahe, daß vielleicht an dieser Dilatation sich auch Vorhofflimmern beteiligt hat. Der vierte Fall, eine dekompensierte Mitralstenose, zeigt die Kleinheit der linken Kammer, die Vergrößerung der beiden Vorhöfe und auch hier das bedeutende Überwiegen des rechten Vorhofs, während man ceteris paribus eine viel stärkere Vergrößerung des l i n k e n Vorhofs erwarten würde, weil dieser der Hauptleidtragende bei der Mitralstenose und dem Staudamm am nächsten ist. Letzteres ist auch der Fall, solange das rechte Herz noch nicht versagt und kräftig Blut in den Lungenkreislauf wirft; sobald aber auch das rechte Herz versagt, verschiebt sich der Stauweiher stromaufwärts und wird das rechte Herz das am stärksten erweiterte.

Wir finden daher sowohl am Krankenbette als am Sektionstisch unsere Vorstellung bestätigt, d a ß b e i b e i d e r s e i t i g e r g l e i c h m ä ß i g e r H e r z e r k r a n k u n g d a s r e c h t e H e r z a m m e i s t e n l e i d e t u n d k e i n e g l e i c h m ä ß i g ü b e r l i n k s u n d r e c h t s v e r t e i l t e K r e i s l a u f s t ö r u n g e n t s t e h e n k a n n.

Stromhindernisse im großen Kreislauf

Nachdem hier die einfachen hydrodynamischen Folgen kardialer Störungen und ihre gesetzmäßigen Beziehungen und Wechselwirkungen besprochen wurden, hätte man in früheren Zeiten die Feder aus der Hand gelegt oder höchstens eine kurze Abhandlung über anatomische Gefäßkrankheiten hinzugefügt. Jetzt werden ganz andere Anforderungen an den Autor gestellt, nachdem man die Überzeugung gewonnen hat, daß es der Blutkreislauf selbst und seine Gesetze sowie die Regulierung der Blutverteilung im Körper sind, welche erst ein wirkliches Begreifen der wichtigen Funktion des Kreislaufapparates möglich machen. Eine große Zahl neuer Tatsachen wurde gesammelt und zahlreiche Gesichtspunkte haben sich aufgetan. Wir werden uns jedoch hier einstweilen dem Programm dieser Klei-

nen Arbeit entsprechend auf diejenigen Hemmnisse und Störungen beschranken deren Folgen als durch einfache mechanische und hydrodynamische Momente hervorgerufen betrachtet und erklart werden können Wir wollen zu diesem Zwecke unsere Wanderung stromaufwarts vom Herzen fortsetzen und vorerst die großen Venengebiete und die venöse und kapillare Peripherie und endlich das arterielle System von diesem Gesichtspunkte aus untersuchen Wir werden die Gesetze des Stromhindernisses Stauung stromaufwarts geringere Blutversorgung stromabwarts auch hier wiederfinden

Die großen Venengebiete

Bei der Perikarditis haben wir eigentlich schon das Herz verlassen und das dem Herzen proximalste Venengebiet durch die Perikardfalten an allen herznahen Gefaßen besonders an den oberen und unteren Hohlvenen und den Lebervenen verengt gefunden Die Folgen waren Stauungen in diesen beiden Gebieten

Die obere und untere Hohlvene haben beide ihr eigenes Quellengebiet Diese beruhren sich gehen ineinander uber Dadurch ist es möglich daß bei vorkommendem Weghindernis einerseits von der anderen Seite Hilfe geleistet werden kann Im Innern des Körpers wird die Wasserscheide dieser Gebiete ungefahr vom Zwerchfell gebildet nur die Venae phrenicae munden unmittelbar unterm Zwerchfell in der gleichen Höhe wie die Lebervenen in die Vena cava inferior Durchbrochen wird die Scheidung an der Ruckenseite durch die Vena azygos und Vena hemiazygos an der Innenseite der vorderen Thoraxwand durch die Fortsetzung der Venae mammariae in die Venae epigastricae der Bauchwand Außerlich kann man die Trennungslinie beider Abflußgebiete welche sich zwischen Processus xyphoides und Nabel befindet bei bestehendem Ödem oder Zyanose deutlich als horizontale Zone beobachten (Fall 1 und 3 S 22) Wo sich auf dem Bauche ein sichtbarer Kollateralkreislauf entwickelt kann man an der Verzweigung und dem Wiederzusammenkommen der kleineren Venen die Grenze beider Quellengebiete genau feststellen Drei verschiedene Typen lassen sich dabei unterscheiden

Bei Verschluß der Ven cav superior (Tumoren Aneurysma, entzundliche Prozesse Thrombosen) schwellen naturlich Kopf Hals, obere Brust und Arme an Die Venen sind prall gefullt die Zyanose ist besonders beim Liegen und Bucken beangstigend Das hohe Venendruckgefalle welches infolge des Staudammes entsteht verdrangt das Blut in der Richtung des nichtgestauten Cava inferior Gebietes Die V azygos ist fur uns nicht oder kaum (Röntgen) zuganglich Die V mammariae aber bekommt man zu Gesicht und zwar dort wo sie unter der sechsten bis siebenten Rippe in der Nahe des Sternums und auch hoch im epigastrischen Winkel an die Ober

flache treten Von hier aus bis zum Eintritt in die Venae saphenae entwickeln sich sehr weite und verlangerte (dadurch geschlangelte) Venen Das Blut strömt uber diesen ganzen Weg von oben nach unten

Im Gebiete der Vena cava inferior können eine oder beide V iliacae oder gar der Hauptstamm der V cav inferior unwegsam geworden sein in diesem Falle werden die gleichen Wege benutzt wodurch sich fast genau das gleiche Bild entwickelt Nur sind Kopf und Hals nicht gestaut hingegen die Venen an der oberen Halfte des Oberschenkels und an den Huften haufig stark erweitert Naturlich geht die Stromrichtung in den Bauchwandvenen jetzt hinauf was sich leicht feststellen laßt infolge der Schwerkraft jedoch im Stehen nicht immer so leicht wie im Liegen

Das dritte große Venengebiet welches uns hier interessiert weil es an einigen Stellen vollkommen gesperrt werden kann ist der splanchnische Kreislauf atrophische Leberzirrhose und Thrombose oder sonstige Verlegung der V portae sind imstande das ganze aus den Bauchorganen abfließende Blut zu sperren Der Stauweiher befindet sich bei der ersten Krankheit im Portalkreislauf bis an die Einmundung der Vena portae in die Leber bei der zweiten bis zu der Verschlußstelle in der Vena portae Eine muskulare Sperrvorrichtung und zwar an den Lebervenen wurde von der Pharmakologie aufgedeckt (Siehe S 75) Bei Aktivierung dieser Sperre wird naturlich vor allem die Leber selbst gestaut Bekanntlich steht der splanchnische Kreislauf nur an wenigen Stellen mit dem großen Kreislauf in unmittelbarer Beruhrung solche Übergange sind die Venen am Ösophagus Kardia Übergang und an den Hamorrhoidalvenen Die dritte Verbindung befindet sich am Lig teres der Leber dem alten verödeten Rest des Nabelstranges wo meistens der Venendruck sich erst wieder einen neuen Weg bahnen muß Ist dies der Fall so machen sich die kollateralen Bestrebungen ebenfalls am Bauche durch das Aufschießen von erweiterten Venenschlingen um den Nabel herum bemerkbar Hier quillt das Blut aus der Tiefe (zuweilen kann man sogar an einer dieser Venen das Rauschen der Quelle hören) und entsteht das beruhmte Caput Medusae Von hier aus werden dann Verbindungen geschaffen mit den oben beschriebenen Zugangen zu den Gebieten beider Hohlvenen die Venae epigastricae sup e inf Begreiflicherweise ist dabei die Richtung des Blutes die normale hinauf zur Vena cava sup hinunter zur Vena saphena Diese Kollateralen genugen in der großen Mehrzahl der Falle nicht um den Stauweiher im splanchnischen Kreislauf und die Bauchwassersucht vollkommen zu dranieren Daher der kluge Vorschlag Talmas Extraverbindungen zwischen Eingeweide und Bauchwand auf chirurgischem Wege herbeizufuhren Nicht selten gelingt es durch das Annähen von Netz oder Milz an die Bauchwand wirklich dieses Ziel zu

erreichen Es ist dann sehr lehrreich *zu sehen* *wie mit der Herstellung* eines besseren Abfließens des Blutes auch die durch Stauung entstandene Flussigkeitsansammlung resorbiert und ausgeschieden wird

Die kleineren und kleinsten Venen

In den kleineren Venengebieten spielen sich naturlich die gleichen Vorgange ab wie in den großen Venen nur in kleinerem Maßstabe Es ware nicht ohne Reiz diese kleineren lokalen Kreislaufstörungen und kollateralen Bildungen in ihren verschiedenen Formen zu schildern es hatte auch fur die Diagnostik der causae et sedes morborum einen padagogischen Wert Da sie aber fur unsere den großen Kreislauf betreffenden Probleme ohne wesentliche Bedeutung sind werden sie hier weiter nicht berucksichtigt werden Hingegen verlangen ohne Zweifel die Funktionen des Venensystems und ihre Störungen unsere Aufmerksamkeit

Die Venen als Werkzeug der Regulierung des Kreislaufs

Schon vor einem halben Jahrhundert wurde in den Vorlesungen uber allgemeine Pathologie gelehrt daß im normalen Tier die je nach den Vorkommnissen im Leben verschiedenen Aufgaben fur den Kreislauf in der Weise gelöst werden daß die eine Abteilung des Kreislaufapparates der anderen zu Hilfe kommt In einem Falle wird eine solche Hilfe durch Verengerung der Blutbahnen geleistet wodurch eine Blutmenge zur Verfugung gestellt wird die anderswo dringend verlangt wird im anderen nimmt eine solche Abteilung durch Erweiterung ihres Strombebietes bereitwilligst Blut auf um unerwunschte Überfullung und Druck irgendwo anders zu entlasten oder sie öffnet selbst ihre Bahnen um das ihr zur Erfullung eigener Funktion zugeteilte Blut aufzunehmen Als erstes klassisches Experiment wurde uns das Gleichbleiben des Blutdruckes bei plötzlicher Sperrung größerer Kreislaufdistrikte (Extremitaten) gezeigt Das splanchnische Venengebiet war schon damals als derjenige Kreislaufabschnitt bekannt welcher durch Erweiterung seiner Venen fur Entlastung des arteriellen Kreislaufs sorgte Nach und nach wurden dann die Wechselbeziehungen von Fullung und Druck und die dadurch stattfindenden Blutverschiebungen bekannt welche es z B ermöglichten den fast leeren Kreislauf des nuchternen Magens beim Beginn der Magensaftabsonderung und der motorischen Magenfunktion prall mit rotem Blute zu fullen Die neueste Kreislaufforschung ist jetzt bemuht diese Vorgange im peripheren Kreislauf welche fur die Regulierung des Kreislaufs wie auch fur die pathologischen Geschehnisse von größter Wichtigkeit sind naher aufzuklaren und in Maß

und Größe zu erfassen Wir werden uns mit diesen Forschungs ergebnissen noch reichlich zu beschaftigen haben Immerhin bleibt aber das Gebiet der splanchnischen Venen noch immer das wichtigste Werkzeug zur Durchfuhrung dieser notwendigen Blutverschiebungen es macht sich auch als solches in der Pathologie deutlich bemerkbar

Das Spiel der Gefaße welche diese Blutverschiebungen bewerk stelligen verlangt naturlich eine zentrale Leitung welche das alles in die richtigen Bahnen lenkt Die Vasomotoren des sympathischen Nervensystems ihrerseits durch höhere Machte geleitet erfullen diese Pflicht mit einer Prazision in Augenblick Ausmaß und Lokali sierung welche wir zu durchschauen noch lange nicht imstande sind Dadurch gestaltet sich das Studium der **Störungen** dieser Regulier vorrichtungen sehr schwierig Nichtsdestoweniger oder vielleicht eben deshalb ist es von der größten Wichtigkeit das uns am Kranken bette *gestellte klinische Problem möglichst tiefgehend zu studieren* und die Resultate zur Mehrung unseres Wissens und der Wissenschaft des Kreislaufs auch unter normalen Bedingungen zu benutzen

Der Kollaps Die Faktoren welche die Weite der Gefaße ihre Blut versorgung ihre Kreislauffunktion uberhaupt und speziell im splanch nischen Venensystem beherrschen sind kurzweg folgende Ein vaso motorisches Nervensystem den Bedurfnissen des Kreislaufs in vielen Hinsichten untergeordnet ein je nach Bedarf vorhandener Tonus der Gefaßwand entsprechende Blutzufuhr aus den Kapillaren und eine vis a tergo welche die Weiterbeförderung via Vena portae Leber und Lebervenen zum rechten Herzen ermöglicht In den letzten Jahren hat man sich insbesondere mit der Venomotorik des splanch nischen Kreislaufs befaßt und auch die Kohlensaure als einen starken venokontraktorischen Faktor erkannt (Heß Gollwitzer Meier)

Das splanchnische Gebiet ist außerdem von dem jeweiligen Raum und Druck im Bauche abhangig Diese werden vom Darmvolumen von Tonus und Kraft der machtigen Muskulatur der Bauchwand und des Zwerchfelles sowie auch sehr merklich von der Körper haltung bestimmt Erweiterung der Bauchvenen verursacht Zuruck gehaltenwerden von Blutmengen welche sich hier nur langsam fort bewegen Es kann dadurch zu ungenugender Blutzufuhr zum Herzen und arterieller Anamie kommen **Körperhaltung** und **Psyche** spielen da eine bedeutende Rolle Die erstere geht schon aus alteren einfachen Experimenten und klinischen Beobachtungen hervor L **Hill** befestigt einen Aal in seiner ganzen Lange auf ein Brett und stellt ihn dann kopf oben senkrecht auf In wenigen Minuten sammelt sich dabei das Blut *im Schwanzteil des Tieres Das sichtbar gemachte Herz erblaßt und* schlagt noch einige Zeit in Leerlauf weiter Auch der Vierfußler das Kaninchen zum Beispiel vertragt diesen Stand in welchem wir Men schen uns tagsuber befinden nicht lange und wird ohnmachtig ver blutet in seine Bauchvenen Ganz identisch ist der Vorgang beim Char

gierten der umfallt und hilflos weggetragen wird wenn die rektorale Rede welcher er in voller Wichs und stillstehend beiwohnen mußte, ihn nicht interessiert oder kein Ende zu nehmen droht In diesem letzteren Falle spielt dann auch nicht die Schwerkraft allein sondern auch die psychische Verfassung des Verunglückten mit denn im Stehparterre unserer Oper steht er stundenlang ungestraft Die Schwerkraftkomponente wird evident sobald man den Betreffenden flach niederlegt das Blut rinnt dann sofort zum Herzen und seine Wangen röten sich wieder (Siehe S 25 26) Dieser sehr verbreitete psychische Faktor ist die Ursache daß beim Blut sehen beim Ekel bei plötzlichem Schrecken und bei sehr vielen anderen Ver anlassungen Kollaps eintritt Wie weit sind wir hier von den kardialen Kreislaufstörungen entfernt wie anders sind die Symptome und trotzdem wie häufig wird dieses Verbluten in die Bauchgefaße noch als Zeichen einer Herzschwache aufgefaßt!

Plötzliche Herabsetzung des Bauchdruckes kann ebenfalls zur Bildung eines Stauweihers in den Bauchvenen und zu schwerer arterieller Anämie führen Bekannt ist die Kollapsgefahr bei Ent fernung großer Bauchtumoren beim Ablassen eines Aszites und nach der Geburt Komprimieren des Bauches ist dann die kausale Behand lung

Fall 5 Eine noch jugendliche kräftige Frau die vor einigen Tagen ein schweres Kind geboren hatte und nachher an akuter Pneumonie erkrankt war wurde von ihrem Arzt in sehr erschöpftem Zustand und nach Atem ringend vorgefunden Die Pneumonie war nicht sehr ausgedehnt die Temperatur mäßig jedoch der Puls sehr klein und frequent warum war bei der sonst robusten gesunden Frau nicht klar Es zeigte sich nun daß der enorme sehr schlaffe Bauch gänzlich ungestützt herunterhing ja bei Halbseitenlage eigentlich neben ihr auf der Matratze lag Zwerch fell und Leber standen sehr tief weil der Bauchinhalt sie nicht mehr unterstützte Dadurch entfiel die Zwerchfellatmung und es blieb ihr nur eine angestrengte er müdende Atmung der oberen Rippen welche die unteren Lungenlappen nicht mit Luft zu füllen vermochte Offenbar handelte es sich um einen Zustand schwerster Überfüllung des Bauchreservoirs durch das Fehlen der Bauchwandspannung und der Zwerchfelltätigkeit Als nun Bauch und Bauchinhalt manuell mit Kraft reponiert und gegen das Zwerchfell hinaufgedrückt wurden besserte sich der Zustand auf der Stelle die Atmung wurde leicht und ausgiebig der Puls füllte sich wieder Das Auf binden eines Polsters auf den Bauch mit Hilfe eines großen den Bauch umfassen den Tuches erfüllte die Aufgabe den Bauchdruck wiederherzustellen und nahm dem Falle seinen bedrohlichen Charakter

Fehlender Bauchdruck Senkung der Eingeweide der Leber und demzufolge Tiefstand des Zwerchfells bilden einen eigenen, nicht selten unbeachtet bleibenden Krankheitszustand die Enteroptose Schlaffe Bauchdecke Verkleinerung des Bauchinhaltes starke Abmagerung und Unterernährung auch konstitutionelle Momente namentlich lange und überschlanke Gestalt spielen dabei eine Rolle Typisch sind der mangelhafte Atemmechanismus und die durch

Blutuberfullung im Bauche verursachte arterielle Anamie mit ihren Folgen Kurzatmigkeit Blasse rascher Ermudbarkeit mangelhafter Energie auch Herzklopfen und allgemeiner Nervositat Man denkt an Herzmuskelschwache an Hysterie Blutkrankheiten schleichende Tuberkulose doch kann man dem Patienten nur helfen wenn man den Zustand richtig erkannt hat Fettansatz fördert die Nervositat be ruhigt Herz und Blutmittel weglaßt dafur eine starke Leibbinde nach Glénard verschreibt und auch kontrolliert ob letztere richtig getragen wird Auch die Graviditat ist ein ausgezeichnetes Mittel gegen diesen Zustand infolge Aufsteigens des die Intestina hoch drangenden Uterus Solche Frauen fuhlen sich nie in ihrem Leben so wohl wie vom funften Schwangerschaftsmonat an Da man aber nicht ewig schwanger bleiben kann stellt sich leider nach der Geburt der alte Zustand zuweilen in noch höherem Maße wieder ein

Der „Schock Mit diesem der englischen Literatur entliehenen Ausdruck bezeichnet man bekanntlich jene Zustande schwerster all gemeiner Kreislaufschwache welche bei heftigen Infektionskrank heiten bei gewissen Vergiftungen nach chirurgischen Eingriffen plötzlich eintreten können auch der anaphylaktische Schock gehört in diese Gruppe Das uns hier ausschließlich interessierende Verhalten des Kreislaufs zeigt große Ahnlichkeit mit dem soeben besprochenen Kollapszustand ganzlich ungenugende Fullung der zum Herzen fuhrenden Venen des Herzens selbst und der großen Arterien daher kleiner frequenter Puls nicht selten tönende Ar terien Offenbar verweilt ein großer Teil des Blutes im peripheren Kreislaufabschnitt Die Frage ob in den Bauchvenen wie beim Kollaps oder im Gebiete der Kapillaren und den angrenzenden klein sten Venen oder gar Arteriolen ist nicht so einfach zu lösen Man kann die Überfullung der Bauchvenen mit Hilfe einer durchaus nicht neu erfundenen Methode nachweisen kraftiger Druck auf den Bauch verdrangt das Blut die Halsvenen schwellen an Seinerzeit vor ungefahr 30 Jahren machten die diesbezuglichen Arbeiten G Olivers und sein Vorschlag diese einfachen Handgriffe in fraglichen Fallen von Bauchstase zur Entscheidung heranzuziehen einen großen Ein druck Wir haben uns damals fleißig bemüht diese Erscheinung auf ihren Wert zu prufen Die Gelegenheit hierzu bot sich uns taglich weil wir uns gerade mit dem systematischen Aufnehmen des Hals venenpulses der Fullungsschwankungen der Halsvenen beschaftigten Im allgemeinen kann man sagen daß da wo wirklich eine gewisse Stasis im Bauche vorhanden ist wie z B in den oben besprochenen Fallen von Enteroptose die Halsvenen stark anschwellen und wie gesagt das Herz infolge der besseren Fullung besser arbeitet In Fallen kardialer Leber und Bauchstauung ist der Handgriff überflussig denn auch ohne Bauchdruck füllen die Halsvenen sich in der mehr hori zontalen Lage sofort und sehr stark (siehe oben) Ubrigens hat der

Handgriff auch bei vielen normalen Menschen einen Einfluß jedoch arbeitet das Herz diese größere Zufuhr sofort restlos auf so daß eine *größere Halsvenenfullung in kurzester Zeit wieder verschwindet* In Fallen von chirurgischem toxischem oder infektiösem Schock in welchen der Puls klein weich und frequent die Atmung beschleunigt Herz und Leber nicht irgendwie bedeutend vergrößert waren sind unsere Bemuhungen durch Bauchdruck Blut zum Herzen zu verdrangen und dadurch die Herztatigkeit und den Puls zu bessern nie von einer deutlichen Wirkung gewesen und gaben nie die soeben beschriebene Erleichterung (wie im Falle 5 S 38) Im Gegenteil Kopf und Hals wurden wohl etwas mehr geschwollen und zyanotisch die Atmung aber nur noch mehr beschleunigt und erschwert der Patient hielt auch diesen Druck nie aus Eigentlich legt dieses Verhalten es nahe anzunehmen daß wie beim Herzpatienten auch hier das Herz nicht imstande war das aus dem Bauche verdrangte Blut zu verarbeiten

Naturlich ist mit diesem negativen Ergebnis nichts entschieden Es bleibt dann aber die ziemlich brennende Frage Wo steckt das Blut in diesen Fallen wenn keine Bauchvenenstasis vorhanden ist auch Leber Herz und Puls zu wenig gefullt sind? In den Lungen? Rasseln kann vorhanden sein namentlich wenn es sich dem Ende nahert auch ist die Atmung beschleunigt in spateren Stadien erschwert oder wenigstens immer oberflachlicher Dies alles ist jedoch noch kein Beweis fur starke Lungenstauung

Es bleibt also die Annahme einer generellen Vasomotorenlahmung wodurch der ganze periphere Gefaßapparat Prakapillaren Kapillaren und vielleicht auch die peripheren Venen erweitert und uberfullt sind hingegen die Arterien die großen Venen Leber Milz Lunge und Herz zu wenig Blut bekommen Man stutzt sich dabei *auf die experimentellen Befunde nach Einspritzung von Pepton* Histamin und ahnlichen kapillarerweiternden Stoffen

Daß diese Vorstellung das klinische Bild des Schocks restlos aufklart kann jedoch schwerlich behauptet werden Unverstandlich bleibt der ungenugende Erfolg einer an der Peripherie angreifenden Therapie Adrenalin kann zwar eine Besserung eine Steigerung der stark herabgesetzten Zirkulationsgröße und geschwindigkeit bewirken rettet jedoch nur selten den Patienten Untersucht man den Kreislauf eines noch nicht im letzten Stadium befindlichen Patienten auf Fullung und *Blutgeschwindigkeit in den peripheren Venen* z B an den Fuß und Unterschenkelvenen so kann man dort noch ein recht ansehnliches Quantum rasch fließenden Blutes feststellen so ganzlich versagt also die Peripherie in einem solchen *Falle nicht!* Daß vielleicht doch eine Art Herzlahmung eine größere Rolle spielt als man jetzt anzunehmen geneigt ist wird auch durch die Tatsache nahegelegt daß bei plötzlicher bedeutender Herabsetzung der Herzkraft das Kreislaufbild eigentlich dem des Schocks

entsprechen kann zum Beispiel beim Koronarinfarkt Nach den ersten stürmischen Erscheinungen stellt sich ein Zustand ohne bedeutendere Herzvergrößerung ohne stärkere Lungen oder Leberstauung ein bei irreduktibel erhöhter Herzfrequenz leeren Arterien mit bedeutend herabgesetztem Druck und ohne stark gefüllte Venen Aus der Unwirksamkeit der Digitalis darf in solchen Fällen noch nicht geschlossen werden daß der Herzmuskel nicht erkrankt ist!

Es wird daher einstweilen wohl notwendig sein unsere Schockpatienten sehr genau auf ihre Kreislauferscheinungen zu untersuchen und die verschiedenen therapeutischen Maßnahmen auf ihre Auswirkung nicht auf das Herz allein zu prüfen sondern besonders auf den peripheren Kreislauf zu achten Im folgenden wird von ähnlichen Zuständen noch häufig die Rede sein

Die Kapillaren

Die letzten Betrachtungen haben uns einen Schritt weiter stromaufwärts gebracht Hiermit betreten wir das Gebiet nein die mystische Welt der Blutkapillaren Wie entzückt muß *Anthonie v Leeuwenhoeck* gewesen sein als er als erster die Kapillaren von *Harvey* postuliert von *Malpighi* anatomisch nachgewiesen am lebenden Tiere durch seine selbstgeschliffenen Glaskügelchen sah und nun bis ins kleinste die Berieselung aller Gewebe und Organe mit dem alle guten Gaben bringenden Blute die sich in Arteriolen verzweigenden und sich zu Venen wieder vereinigenden Gefäßchen beobachten konnte Hier in den Kapillaren spielen sich die Wunder der Natur ab da wo das Leben durch Zufuhr von Wasser Gasen gelösten Substanzen und Nahrung erhalten wird und auch der Austausch von Abfallprodukten stattfindet In unaufhörlichem Kreislauf waltet das Blut und hier ist die Stelle wo sich der Zweck der Kreislauforgane der emsigen Herztätigkeit erfüllt!

Das Studium der Kapillaren steht augenblicklich im Zentrum der Forschung und mit der Erkenntnis zahlreicher neuer Tatsachen ist immer noch des Wunders kein Ende Früher stellten wir uns vor daß der Weg vom arteriellen System zum venösen *nur über die feinsten Kapillaren stattfindet* seit *Krogh* wissen wir daß die Kapillaren viel mehr der Blutbahn neben als endgeschaltet angeschlossen sind Sie bilden Seitenwege welche von der Landstraße abzweigen und nun ihrerseits ein Netz über ganze Distrikte bildend den Verkehr mit jedem einzelnen Haus oder Gehöft ermöglichen Dieses Netz lenkt einen Teil des Verkehrs von der Hauptstraße ab mag ihn sogar zeitweilig fast gänzlich absorbieren die Hauptstraße aber auch wenn sie schon recht verlassen erscheint bleibt Hauptstraße und kürzester Weg

Das Betragen dieser kleinsten Blutwege entspricht diesem Schema denn eine große Zahl der Kapillaren ja ganze Kapillarnetze

können sich je nach der augenblicklichen Tätigkeit des Organes weit öffnen und Blut in sich aufnehmen oder sich verengern sogar regelrecht sperren wobei dann das Organ nur sehr wenig Blut erhält und durchläßt Die oben geschilderte Anordnung macht es möglich, daß der Hauptverkehr unter diesen lokalen Notwendigkeiten nicht leidet denn der Blutdruck braucht wie wir sahen dadurch nicht berührt zu werden

Uns wird durch diese Anordnungen Vieles klar was uns früher nicht recht verständlich war so vor allem die Tatsache daß das Blut, auch stromabwärts vom Kapillargebiet in den Venen eine solche vis a tergo so viel Schwung behält daß sich in der Zeiteinheit genau so viel Blut im rechten Vorhof einfindet wie die linke Kammer in den Kreislauf hineingeworfen hat Es braucht ja nicht alles Blut durch alle Kapillaren zu fließen!

Örtliche Kreislaufstörungen in diesem wohlgeordneten, sorgfältig regulierten Betrieb der kleinsten Gefäße werden kaum einen Einfluß auf den allgemeinen Kreislauf haben Gestautes Blut wird leicht weggeleitet durch Blutleere bedrohten Gebieten kann von allen Seiten Blut zugeführt werden Die Folgen einer solchen Störung hängen gänzlich davon ab welches Organ davon betroffen wird (Gehirn Niere) und ob wirklich Gelegenheit zu kollateraler Blutverschaffung vorhanden ist

Störungen aber die das ganze Kapillarnetz oder den Großteil davon betreffen können den Gesamtkreislauf sogar lähmlegen So gibt es Gifte Hormone (Histamin u a) welche den Großteil der Kapillaren maximal erweitern Die Folgen sind der Reihe nach Anhäufung von Blut in diesem erweiterten Gebiete dadurch bedeutende Verringerung der im übrigen Kreislauf zirkulierenden Blutmenge allgemeine Herabsetzung der Strömungsgeschwindigkeit mangelhafte Füllung der Venen des Herzens der Arterien Kollaps Schock (Siehe S 40) Andererseits kann ausgedehnte Verengerung der Kapillaren so viel Blut verdrängen daß die in den übrigen Gefäßen befindliche Blutmenge ungebührlich erhöht und zu gleicher Zeit der arterielle Widerstand gesteigert wird Das Herz wird dabei von zwei Seiten durch allzu starke Zufuhr und durch allzu hohen Widerstand überlastet

Passiv kann die Peripherie des Kreislaufapparates gestaut werden wenn der Übertritt von Blut in die Venen durch irgendeinen pathologischen Faktor behindert wird Stromaufwärts muß sich das als erhöhter Widerstand also ceteris paribus als Hemmung der peripheren Entleerung des arteriellen Systems fühlbar machen

Es ist am Kapillarsystem und nur bei diesem einen Gefäßgebiete mit einem wichtigen Faktor zu rechnen Das Blut ändert sich in diesem Bereich sowohl qualitativ als quantitativ Das gilt für die Gase wie für die sonstigen in die Gewebe übertretenden Stoffe wofür andere

Stoffe aufgenommen werden es gilt aber vor allem vom Wasser Wenn auch vielleicht unter physiologischen Bedingungen im all gemeinen ungefahr so viel Wasser abgegeben wie aufgenommen wird so gibt es doch pathologische Umstande in welchen sehr viel Wasser aus dem Blute austritt und sehr viel Wasser in den Geweben zuruck gehalten wird und umgekehrt Unter Einfluß von Histamin scheidet infolge starker Erweiterung der Kapillaren und dadurch ausgelöster Permeabilitatssteigerung der Kapillarwande so viel Wasser aus der Blutbahn aus daß das Blut bedeutend eingedickt wird und mit einem viel höheren Prozentsatz *roter Blutkörperchen* und *Hamoglobin* aus dem Kapillarnetz hervorgeht als es beim Betreten dieses Gebietes aufweisen konnte Dieses eine Beispiel möge zeigen welche ganz ex zeptionelle Stellung das Kapillarnetz in der Physiologie und der Patho logie des Kreislaufs einnimmt (siehe Wasserwechsel S 47)

Anatomische Veränderungen der Kapillaren wirken sich in ört lichen Störungen aus deren allgemeine Wichtigkeit von dem Werte des befallenen Organes bestimmt wird Im allgemeinen sind solche Veranderungen von viel größerer Bedeutung wenn sie die zum *Kapillarnetz fuhrenden kleinsten Arterien betreffen (periphere Skle rose)* denn Schwund von Kapillaren kann durch Neubildung und durch Kollateralzufuhr ersetzt werden In einigen Organen aber wirkt ihr Zugrundegehen katastrophal auf den Gesamtkreislauf namlich in der Lunge Wir kennen diesen Zustand beim essentiellen Emphysem nach Asthma und bei stark schrumpfenden Prozes en in der Lunge (siehe S 13) Auch die Bedeutung von Verengerung und Schwund der Nierenkapillaren ist wohl allgemein bekannt

Das arterielle System

Der arterielle Abschnitt des Kreislaufapparates arbeitet unter wesentlich anderen Bedingungen wie die übrigen schon besprochenen Gebiete Handelte es sich bis jetzt um das Weiterleiten und zum Her zen Zuruckfuhren der zufließenden Blutmengen so gilt es in dem Aortagebiet der Verteilung des Blutes an alle Teile des Körpers mit alleiniger Ausnahme der Lunge Das Schlag und Minutenvolumen der linken Kammer muß im Anfangsstuck der Aorta zur Ganze auf genommen und in der Zeiteinheit restlos weiterbefördert werden Zu diesem letzteren Zwecke wirkt die Spannung und Dehnung der Ge faßwand der großen Arterien in der Weise mit daß sie die vom Herzen stammende Energie welche diese Spannung hervorrief zum Aufrecht erhalten des arteriellen Druckes wahrend der Herzdiastole verwendet Der Druck in der Aorta ist unter allen Bedingungen in ihrem proxi malsten Abteil unmittelbar an der Quelle der Energie am höchsten und nimmt nach den Gesetzen der kommunizierenden Gefaße nach der Peripherie allmahlich ab

Das örtliche Kreislaufhindernis hat hier natürlich die gleichen

gesetzmaßigen Folgen die wir an anderer Stelle schon kennengelernt haben Anstauung oberhalb des Staudammes verringerte Kreislauf größe stromabwarts außern sich jedoch in anderer Form der starke Bau der arteriellen Gefaßwand widersetzt sich der Bildung eines großen örtlichen Stauweihers dafur aber wird sich die Anstauung *viel höher stromaufwarts bemerkbar machen* und zwar hauptsach lich durch höheren arteriellen Druck Hier kann uns das einfache Schema der kommunizierenden Gefaße und ihrer Sperrung wie wir das in der Schule gelernt haben sehr nutzlich sein weshalb es hier kurz erlautert werden möge

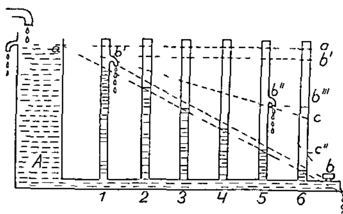


Abb 5 Darstellung der Vorgänge in kommunizierenden Gefaßen bei Sperrung des Flussigkeitsstromes (siehe Text)

Abb 5 zeigt in A ein Gefaß mit auf konstanter Höhe gehaltener Wassermenge verbunden mit den kommunizierenden Steigrohren 1—6 in welchen die Höhe des Flussigkeitsspiegels den jeweiligen örtlichen Druck im horizontalen Abflußrohr an zeigt Ist der Sperrhahn b geschlossen so herrscht im ganzen System der gleiche Druck wie am Boden des Gefaßes A (a—a) Ist der Sperrhahn b weit offen so daß am Ende des horizontalen Rohres kein Druck mehr herrscht so sinkt der Druck von der vollen Hohe geradlinig auf Null (a—b) ab Wird der Hahn teilweise geschlossen so zeigt sich der Druckablauf wie z B in a—c In diesem starren System steigt also bei plotzlichem Schließen des Sperrhahnes b der Druck in 6 von Null auf vollen *Druck* Bei *Anwendung dieser* Erscheinungen auf den Aortenkreislauf mussen wir damit rechnen daß die von der Aorta abzweigenden Arterien zwischen der Sperr stelle und dem Anfang der Aorta als Abflußstellen funktionieren Der **Sperrdruck** der auf der Arterienwand an der gesperrten Stelle lastet wird so hoch werden wie der Blutdruck an der nachst stromaufwarts gelegenen abzweigenden Arterie (Ab flußstelle) In unserem Schema befindet sich eine solche Abflußstelle im 1 und 5 Steigrohr

Bei gesperrtem Hahn b und geschlossener Abflußstelle b ist der Druckablauf wie die Linie a—b —b Öffnet man nun den Sperrhahn b so ändert sich der Druckablauf wie a—b —b

Bei gesperrtem b und b ist der Ablauf wie a—b —b bei offenem b wird er wie a—b —b sein Transponieren wir das Ganze ins Arterielle so begreifen wir daß b i Anlegung unserer sperrenden Manschette zwisch n 5 und 6 wir nicht den vor dieser Absperrung in der Arterie herrschenden Druck messen sondern einen höheren nämlich den Druck der an der Stelle der stromaufwärts nächsten ab zweigenden Arterie herrscht nämlich ,—b

Diese einfachen altbekannten Tatsachen verdienen deswegen sich noch einmal *in unseren Vorstellungen einen Platz zu erobern* weil das örtliche Stromhindernis im arteriellen Kreislauf eine große und bedeutende Rolle spielt Gefäßwanderkrankung mit Verengerung des Lumens Thrombose und namentlich die plötzlich völlig sperrende Embolie zwingen uns zu ihrer Berücksichtigung Wir sahen daß der Sperrdruck ceteris paribus am höchsten sein muß in denjenigen Arte rien welche dem Herzen am nächsten sind Fragen wir welche Arte rien das sind so ist die Antwort — die Art coronariae! Da denkt man sofort an die eigentümliche Prädisposition dieser Arterien für sklerotische Prozesse auch da wo die übrigen Arterien noch frei sind und an den gewaltigen Schmerz den ein plötzlicher Verschluß oder starke Verengerung der Kranzarterien hervorrufen kann Eine Em bolie tut in allen Organen auch in sonst normalen Arterien sehr weh nirgendwo aber ist der Schmerz so heftig wie bei Koronarverschluß So befinden wir uns auf einmal auf einem höchst wichtigen und viel umstrittenen Gebiet der Kreislaufpathologie Ob es die gesperrte Arterie ist welche schmerzt oder das durch die Sperre anämisierte Gewebsgebiet ist nur deshalb nicht entschieden weil die vorhandenen Daten noch nicht genugend bekannt oder anerkannt worden sind Untersucht man die gesperrten Arterien auch stromaufwärts wie es Kutschera Aichbergen (27) als erster an den Koronararterien tat so findet man in chronischen Fällen sehr starke Erweiterung mit Schwund sowohl der Muskelschichten wie der Elastika

Wie sich das örtliche Hindernis stromabwärts auswirkt hängt wie gesagt von den kollateralen Versorgungsmöglichkeiten ab Je zentraler die Sperre um so größere Bahnen werden dabei zur Ver fügung stehen Gewöhnlich kommt es nicht zu so sichtbaren Gefäß erweiterungen wie bei den dehnbaren Hautvenen Trotzdem gibt es ein Beispiel welches an die oben kurz geschilderten Venenbilder er innert nämlich den Kollateralkreislauf bei der angeborenen Stenose des Isthmus aortae

Dieser Engpaß befindet sich am Ende des Arcus aortae unterhalb der Ab zweigung der linken Art subclavia auch befindet sich der Ductus arteriosus Botalli *der bei dieser Mißbildung häufig offen ist noch knapp vor der eng n Stelle* Infolge dieses bedeutenden Strömungshindernisses wäre die ganze Aorta abdominalis auf sehr geringe Blutzufuhr ang wiesen wenn nicht von allem Anfang an ein merk würdiger Kollateralkreislauf sich entwickeln würde An der vorderen Körperwand werden die Arteriae mammariae internae welche genau so wie wir das von den be gleitenden Venen hörten mit den Arteriae ep gastricae in breiter Verbindung s

in weite Blutbahnen umgewandelt. An der Rückenseite entwickeln sich die tiefen Schulter- und Schulterblattarterien in gleicher Weise und führen ihren Inhalt auf dem Wege der oberen Interkostalarterien bei umgekehrter Stromrichtung zur Aorta abdominalis. So wird ein den Anforderungen entsprechender Umweg gefunden, auf welchem das Ziel des arteriellen Blutes, die Aorta descendens, erreicht wird. Die stark geschlängelten Arterien werden *gewöhnlich am oberen Rücken und an den oberen* seitlichen Interkostalräumen sichtbar. Der Aortenbogen ist bis zum Engpaß meistens relativ stark erweitert.

Der arterielle Blutdruck. Wir betreten hier ein ungemein wichtiges Gebiet der Kreislaufpathologie. Zwar sind die hier zu erörternden Vorgänge zum Teil längst bekannt, ihre Wertung aber und ihre Beziehungen untereinander geben vielfach Veranlassung zu Mißverständnissen. Wir müssen trachten, die mehr allgemeinen Gesichtspunkte auf diesem Gebiete und die wichtigsten klinischen Zustände miteinander in Einklang zu bringen. Im Rahmen dieser Arbeit erscheint es dann vor allem noch einmal nötig, auf den Unterschied in Form und Funktion der arteriellen und der venösen Stauung zurückzukommen, und zwar in folgender Hinsicht: Bei den Venen und Kapillaren haben wir vor allem die Füllungsverhältnisse der Gefäße hervorgehoben, den Druck deswegen weniger berücksichtigt, weil bei dem geringen Widerstand der Gefäßwände sich die Volumsänderungen in viel stärkerem Maße bemerkbar machen als die — auch viel weniger untersuchten — damit einhergehenden Druckschwankungen. Die viel mehr Widerstand leistende Arterienwand läßt, wie wir sahen, viel weniger Füllungsschwankungen zu und äußert sich viel deutlicher in den Veränderungen des (arteriellen) Druckes. Wir werden daher bei unseren Betrachtungen zur Erkennung der Geschehnisse hauptsächlich über die Änderungen dieses letzteren Faktors sprechen müssen.

$P = V_s \times W$ ist die Formel für den Blutdruck, wobei P = den Druck, V_s = das Minutenvolumen, W = den Gesamtwiderstand der Blutbahn vertreten. Man würde denken, daß die beiden Faktoren, deren Produkt der Blutdruck ist, immer als gleichwertig in ihrer Bedeutung betrachtet worden wären. Im Laufe der Zeit aber waren beide in sehr verschiedenem Ausmaße von der Aufmerksamkeit der Forscher begünstigt. In unserer Jugend (ich spreche von der älteren Generation[1]) war das Herz Favorit: war die arterielle Versorgung des Organismus ungenügend, so wurde Herzschwäche als daran schuldig betrachtet; war im Gegenteil das arterielle System unter Druck gestellt und stark gefüllt, so mußte irgendwie reflektorisch oder toxisch bedingte Mehrarbeit des Herzens daran beteiligt sein, eine Mehrarbeit, die sich in essentieller Hypertrophie des Myokards dokumentierte. Diese Meinung kam besonders bei den verschiedenen Formen der Nephritis zur Geltung. Der wesentliche Konnex zwischen Hochdruck, Herz und Widerstand wurde am Krankenbette erst später infolge der allgemein durchgeführten Blutdruckmessung er-

kannt Dann aber kam die Periode in welcher der erhöhte Widerstand als Hauptsache galt als wurde das bedrängte Herz nur sekundär in Mitleidenschaft gezogen und zu größerer Arbeit gezwungen sein In den letzten Jahren hat sich die Forschung mit der größten Energie auf das Minutenvolumen geworfen Dabei ist eine so große Zahl zum Teil recht unerwarteter Tatsachen bekannt geworden daß die Medizinische Praxis unter deren Fahne dieses Büchlein segelt dabei nicht gleichgültig zuschauen kann und sich ihrerseits an dem Studium beteiligen soll um zu einer richtigen Wertung zu gelangen Wir werden daher vor allem an dieser Stelle beide Faktoren des Blutdruckes und zwar sowohl bei zu niedrigem als zu hohem Blutdruck berücksichtigen müssen und ohne auf Methodik und Kurvenanalyse einzugehen einige wichtige Hauptsachen zu besprechen haben

Die Änderungen der Peripherie welche den Blutdruck beherrschen vermögen dies so wie im sonstigen Gefäßapparat durch Verengerung und Erweiterung ihres Querschnittes Da aber der Blutdruck sich unter normalen Bedingungen auch bei Sperrung größerer Gefäßabschnitte sofort anpaßt und auf gleicher Höhe bleibt (siehe Seite 36) müssen wohl ganz große oder ganz besondere Gebiete sich an dieser Änderung des Querschnittes beteiligen soll sich dies in Blutdruckänderung auswirken Von diesen verschiedenen Gebieten ist zweifellos das splanchnische Gebiet das wichtigste Wir haben es als solches schon ausführlich besprochen Andererseits kommen aber auch generelle den ganzen peripheren Kreislauf betreffende Querschnittsänderungen vor Sie werden im allgemeinen einem vasomotorischen Nervensystem mit haupt und untergeordneten zerebralen und medullaren Zentren zugeschrieben Es gibt auch wirksame im Körper selbst gebildete Stoffe welche einen Einfluß auf die Gefäßweite haben von denen die wichtigsten das Adrenalin als konstriktorisch und das Histamin als dilatatorisch bekannt sind Sie stehen zum vasomotorischen Nervensystem in doppeltem Verhältnis denn sie wirken auf das Nervensystem ein und werden umgekehrt auch unter dessen Einfluß zur Erreichung einer allgemeinen Wirkung ins Blut ausgeschwemmt Es werden immer mehr von solchen hormonal wirkenden Substanzen im Körper gefunden Bedenkt man dabei daß in einigen innersekretorischen Organen sowohl konstriktorische wie dilatatorische Stoffe ausgeschieden werden so daß alle möglichen Kombinationen von Wirkung und Gegenwirkung zustande kommen können so erscheint die Analyse dieser verschiedenen Wirkungen unendlich schwer Wir werden zwar alle diese Befunde zur Kenntnis nehmen und ihre eventuellen therapeutischen Konsequenzen dankbar akzeptieren uns hier aber auf ihre tatsächlichen Auswirkungen auf den arteriellen Kreislauf beschränken Die Probleme des Tiefdruckes und des Hochdruckes beim Menschen sind wie häufig wir

ihnen auch begegnen und wie fleißig man sich bemüht in ihrer Kompliziertheit noch nicht einmal entfernt als gelöst zu betrachten

Arterieller Tiefdruck Die periphere Ursache eines Absinkens des Blutdruckes ist die Erweiterung der Endverzweigungen des arteriellen Systems Die erste Folge des geringeren Blutdruckes *ist einstweilen eine* Entlastung des Herzens und zugleich eine Herabsetzung der Blutgeschwindigkeit in samtlichen Organen Letztere aber verlangt in zweiter Instanz Mehrarbeit seitens des Herzens zwecks Hebung des Kreislaufs Es gilt durch das Aufbringen eines größeren Einzelschlagvolumens oder durch Erhöhung der Schlagzahl in der Minute es so weit zu bringen daß trotz schnelleren Abfließens des Blutes in die Peripherie die Aorta dermaßen gefullt wird daß eine fur einen normalen Druck genugende Wandspannung erreicht wird Dies ist jedoch nur möglich wenn erstens der Herzmuskel dieser Mehrarbeit gewachsen ist und zweitens durch vermehrten Zufluß aus der Peripherie das Herz das nötige Blutmaterial zu dieser größeren Leistung zugefuhrt bekommt Dazu aber ist es notwendig daß das Venensystem durch entsprechend höhere Wandspannung und Verengerung des Lumens fur eine schnellere Beförderung des Blutes aus den Arterien zum Herzen sorgt Fehlt diese venomotorische Funktion dann bleibt das Blut in der Peripherie hangen das Herz wird zu wenig Blut erhalten denn es kann nun einmal nicht mehr Blut verarbeiten als es zugeschickt bekommt der Kreislauf verkummert durch Verblutung in die Peripherie

Liegt die Ursache zentral wirft das linke Herz aus welchem Grunde immer zu wenig Blut in die Aorta dann wird infolgedessen die Aortenwand zu wenig gespannt der Blutdruck sinkt ab Wird hierdurch irgendwie der periphere Kreislauf gefahrdet so können verschiedene Regulierungsmechanismen in Tatigkeit versetzt werden Das Herz wird reflektorisch zu starkerer Arbeit angefacht was bei einem kranken Herzen nicht ohne Nachteil stattfinden mag oder es bringt einfach die Mehrarbeit nicht auf die Kompensation wird nicht erreicht Dann aber kann ein zweiter nutzlicher Mechanismus eingreifen eine reflektorische Verengerung der Peripherie des arteriellen Systems der Abfluß wird gehemmt die Aorta besser gefullt der Druck unter naher zu erörternden Bedingungen hoch gehalten und es kann dadurch eine bessere Durchblutung erreicht werden Hierbei kann es sogar zu merkwurdigen Graden der Überkompensation kommen Auffallenderweise kann das besonders stark bei *der reinen Mitralstenose der Fall sein*

Fall 6 Bei einer 58jahrigen sehr mageren Frau mit typischer unkomplizierter Mitralstenose und zweifellos außerst kleinem Schlagvolumen (kleine Pulse sehr enge Arterien) zeigte der Blutdruck die Rekordzahl 300 mm Hg ! Sie hatte keine anderen Beschwerden als die einer der Stenose entsprechend eingeschränkten korperlichen Leistungsfähigkeit Dafür daß sie nicht zu viel tat sorgte die bei der

Mitralstenose natürlich sofort einsetzende Dyspnoe. 7 Jahre später, 65 Jahre alt, zeigte sie sich noch einmal. Der Zustand hatte sich in keiner Hinsicht geändert. Sie fühlte sich wohl und war nur gekommen, weil sie versprochen hatte, sich gelegentlich noch einmal vorzustellen.

Epikrise. Daß gerade bei der Mitralstenose — mehr als bei der Mitralinsuffizienz — ein so hoher Blutdruck aufgebracht und ohne Schaden vertragen wird, ist wohl erklärlich. Der linke Ventrikel, der allein diesen hohen Blutdruck zu überwinden hat, ist weder krank, noch sonst durch den Klappenfehler irgendwie in Mitleidenschaft gezogen; er bekommt nur zu wenig Blut, bleibt (oder wird) klein, kann aber sehr lange sein kleines Schlagvolumen austreiben. Die Überlastung trifft nach wie vor den linken Vorhof, den Lungenkreislauf und den r e c h t e n Ventrikel (siehe S. 11). Beliebt nun im Interesse der Gesamtheit die Kreislaufverwaltung einen höheren Widerstand einzuschalten, so besteht kein Grund, weshalb der intakte linke Ventrikel nicht in normaler Weise reagieren würde. Ist dann der Patient sehr mager und dabei die Gesamtblutmenge im Laufe der Zeit stark vermindert (siehe S. 85), so kann einerseits die unter Hochdruck gestellte Aorta sehr wohl die nicht sehr umfangreiche Peripherie genügend durchbluten und braucht dadurch andererseits die unvermeidliche Lungenstauung nicht übermäßig stark zu sein.

Arterieller Hochdruck. Arterieller Hochdruck wird im Gegenteil zum Tiefdruck entweder durch erhöhten Widerstand im Gesamtkreislauf oder durch übernormale Leistungen des Herzens verursacht, auch können beide Faktoren zusammen vorhanden sein. Beide werden hier etwas ausführlicher besprochen werden müssen.

Zunahme des arteriellen Widerstandes. Wenn der Gesamtwiderstand größer wird, steigt der Blutdruck und dieser kann auch höher bleiben infolge der d u r c h d e n H o c h d r u c k s e l b s t hervorgerufenen vermehrten Tätigkeit der linken Kammer. (Siehe unten „dynamische Gesetze" S. 4.) Es ist ganz erstaunlich, wieviel ein gesunder Herzmuskel in dieser Hinsicht leisten kann[1]). Jahrzehnte hindurch kann ein bis zu 80% und mehr gesteigerter Blutdruck ohne sonstige Kreislaufstörung vertragen werden. Die subjektiven Symptome sind eher in gewissen empfindlichen Organen zu spüren. Kopfschmerz, Oppressionsgefühle, welche sich zum anginösen Schmerz steigern können, dürfen r e c t e nicht ohne weiteres als Zeichen einer eingetretenen Herzinsuffizienz, sondern eventuell als im arteriellen System selbst lokalisierte Empfindungen gedeutet werden. Büßt die linke Kammer an

[1]) Vielleicht liegt die Erklärung in der von S. Weiß und L. B. Ellis festgestellten Tatsache, daß beim Hochdruck auch bei einer Steigerung des peripheren Widerstandes auf das Doppelte die Arbeit der linken Kammer nur um 4 größer als bei normalen Personen war. (Amer. Heart J. 5, Nr. 4, 1930.)

Leistungsfähigkeit ein, so entstehen unwiderruflich die Erscheinungen der Linksinsuffizienz zu gleicher Zeit senkt sich der Blutdruck Das ist daher ein böses Zeichen um so mehr als es bekanntlich sehr schwer ist in diesen Fällen Hilfe zu leisten Digitalis ist hier trotz Hochdruck dringendst angezeigt

Die hier geschilderten Vorgänge sind zweifellos jedem erfahrenen Arzt bekannt denn sie lassen sich am Krankenbette des insuffizient gewordenen Hochdruckherzens immer wieder beobachten Es mag daher befremdend erscheinen daß man bei hohen Graden von Herzinsuffizienz sehr hohe Blutdrucksteigerungen feststellen kann und sie nach erfolgreicher Behandlung des Herzens auch wieder verschwinden sieht Sahli hat für solche Fälle den Namen Hochdruckstauung geprägt Die von ihm gegebene und allgemein angenommene Erklärung ist daß die Kohlensäureüberfüllung des zum Atemzentrum gelangenden Blutes als Teilfaktor der Regulierungsvorgänge den Blutdruck steigert Therapeutische Besserung des Kreislaufs soll dann diesen ursächlichen Faktor aufheben Gegen die Berechtigung dieser Erklärung ist wohl nichts einzuwenden jedoch kann der blutdrucksteigernde Einfluß höchster kardialer Stauung in vielen Fällen auch auf einen einfachen hämodynamischen Faktor zurückgeführt werden

Stauungshochdruck Wir haben als etwas Selbstverständliches angenommen daß das Abfließen des Blutes aus den kleinsten Arterien in die Kapillaren ceteris paribus den Widerstand im Kreislauf und namentlich Füllung und Druck im arteriellen System bestimmen kann Nun gibt es kardiale Stauungszustände in welchen es sich nicht mehr um einfache Anstauung großer Blutmengen unmittelbar vor auch teilweise in dem rechten Herzen handelt sondern wo auch infolge Trikuspidalinsuffizienz regelrecht eine Rückstauung von Blut aus dem rechten Herzen in die Venen stattfindet (S 18ff) Daß dabei die Stauung so hoch stromaufwärts bemerkbar wird daß der Übertritt des Blutes aus dem arteriellen in den venösen Abschnitt des Kreislaufapparates in den Kapillaren empfindlich gehemmt wird erscheint bei einiger Überlegung fast selbstverständlich Man soll sich nur erst vorstellen was jetzt tatsächlich im Kreislauf vorgeht Von links wird die Aorta unter systolischem Kammerdruck gefüllt während das rechte Herz zu gleicher Zeit und ebenfalls unter systolischem Kammerdruck Blut in die großen Venen zurückwirft Es mag wohl wahr sein daß die Leber freundlich genug ist einen Teil dieses Blutes in sich aufzunehmen und sozusagen den Stoß teilweise aufzufangen jedenfalls muß es unter diesen Umständen zu sehr hohem Venendruck und zu sehr starker Abnahme des arterio venösen Druckgefälles kommen Es wäre ein Wunder wenn dabei nicht diese ins Gewicht fallende Hemmung des Abfließens des Blutes aus der Peripherie auf direktem Wege eine Steigerung des arteriellen Blutdruckes verursachen würde Die einzige

Bedingung dazu ist daß das linke Herz noch imstande ist die Drucksteigerung zu überwinden Diese Bedingung ist in allen jenen Fällen erfüllt in welchen das rechte Herz stärker erkrankt ist als das linke und das ist bei vielen großen Herzinsuffizienzen der Fall Unter den mitgeteilten Fällen befinden sich einige (Fall 2 und 4 S 21 und 23) welche diese Vorgänge illustrieren und auch dartun wie Digitalis sogar in relativ großen Dosen, durch Behebung der Herzinsuffizienz und besseres Ausschöpfen des venösen Stauweihers den extra gesteigerten Blutdruck absinken läßt Es handelt sich dabei meistens um Hochdruck von vornherein Ein in dieser Beziehung lehrreicher Fall sei hier noch kurz mitgeteilt

Fall 7 Br ♂ 34 Jahre Lues mit 18 und 20 Jahren gut behandelt WaR war immer negativ Pat ist seit seinem 16 Jahre nierenkrank Zur Zeit fühlt er sich zeitweise ganz gesund (häufig war der Harnbefund vollkommen negativ) so daß er mit 23 Jahren heiraten konnte immerhin zeigten sich hier und da wohl als nephritisch zu deutende Symptome Mit 27 Jahren fing er an sein Herz zu fühlen konnte nicht schnell gehen Auch kamen später Herzschmerzen wobei ihm schlecht wurde auch Schmerzen im linken Arm es wurden ihm wiederholt bei solchen Zuständen Aderlässe bis zu 600 ccm gemacht 2½ Monate vor seinem ersten Besuch wieder solche Anfälle welche mit Nitroglyzerin und Strychnininjektionen erfolgreich bekämpft wurden Es wurde von Herzasthma gesprochen Er nimmt fortwährend kleine Dosen Digitalis 0 05 zweimal täglich

St pr Pat sieht elend aus sehr großes Herz (orthodiagr LV 10 cm m l) auch nach rechts vergrößert Aorta breit Im Liegen ein etwas fauchendes Geräusch über linkem Ventrikel und Aorta Die Arterien scheinen weit zu sein der Puls schlägt sehr hart an Blutdruck 235/160! mm Hg Keine Aorteninsuffizienz Leber geschwollen keine Ödeme Der hohe diastolische Druck schien für nephritischen Hochdruck zu sprechen Aufnahme im Sanatorium für weitere Beobachtung Mit Rücksicht auf Ekg wird Digitalis weggelassen Pat liegt im Bett Urin — Alb 9 pro Mille Sed Viele rote wenige weiße Blutkörperchen mäßig Zylinder Wasserversuch Ausscheidung verzögert S G nicht unter 1003 Konzentrationsversuch nicht höher als S G 1018 Rest-N 39 mg % Ekg Linksüberwiegen keine sicheren Zeichen von Myokardleiden

Pat fühlt sich im Bett ohne Medikamente immer schlechter Am 4 Tag nach der Aufnahme höchst bedrohlicher Zustand Pat wälzt sich im Bette kann schlecht liegen jedoch gar nicht sitzen infolge gewaltiger Leberschwellung Ein hämmernder Leberpuls (bei regelmäßigem Herzen!) hebt die aufgelegte Hand Am Herzen Freq 110—115 ein stark brausendes systol Trikuspidalgeräusch das bis weit auf der Leber hörbar ist Der Blutdruck ist auf 275/200!! mm Hg gestiegen und alterniert stark Es ist ein allerschwerster Zustand jedoch fehlt die stärkere Lungenstauung In diesen Tagen der Bettruhe ist schwerste Rechtsinsuffizienz mit Schlußunfähigkeit der Trikuspidalklappe aufgetreten und eine hochgradige kardiale Stauung welche vom rechten Herzen unter Druck gestellt wird

Der einzige annehmbare Grund für diese gewaltige Verschlechterung des Zustandes war das Weglassen der Digitalis Da Pat vorher auch nur kleine Dosen gebraucht hatte werden zwei tägliche Dosen von 0 1 D g titr wegen des Blutdruckes in Verbindung mit Chinin und Papaverin gegeben und zur Entleerung des retinierten Wassers Euphyllinzäpfchen ein bis zweimal täglich gereicht Aderlaß von 250 ccm

kleine Morphindosen zur subjektiven Linderung die aber nicht vertragen wurden Der Erfolg war verbluffend Nach 2 Tagen waren schon beinahe 6 Liter Urin ab gegangen nach weiteren 3 Tagen hatten Leber und Herz an Umfang sehr abgenom men der Leberpuls war weg das Insuffizienzgerausch der Trikuspidal klappe war verschwunden Der Aderlaß hatte subjektiv sehr gut gewirkt Der Blutdruck hatte sich gesenkt auf 250/150'' mm Hg Puls reg 88 p m 2 Tage spater Blutdruck 230/140 mm Hg Digitalis weggelassen nur noch Strophantus verschrieben Er wurde in ein Sanatorium auf dem Lande entlassen wo er sich zuerst wohl fuhlte dann nach einigen Wochen plötzlich verschied

Epikrise Die Diagnose ist schwer Der Verdacht auf schwere Nephritis mit uramischem Anfall lag nahe doch war der Rest N nicht hoch der Wasserverbrauch nicht sonderlich gestört Ob rechts seitige Koronarverengerung vorlag woran man wegen des offen kundigen Versagens des rechten Herzens und der vorangehenden anginösen Schmerzen denken mußte blieb unentschieden Jedenfalls war das linke Herz in relativ besserem Zustand denn es brachte noch einen exzessiven Blutdruck zustande Die hohe Bedeutung des Falles fur die am Krankenbette stehenden Arzte war die nach Weglassen kleiner Digitalisdosen auftretende akuteste rechts seitige Herzerweiterung mit Trikuspidalinsuffizienz die gewaltige Steigerung des schon sehr hohen Blutdruckes sowohl systolisch als diastolisch und sofortiges Absinken beider Werte bei Digitalistherapie Bedenkt man dabei daß die Lunge nicht gestaut erschien die Not des Patienten von der Unmöglichkeit herruhrte bei der uber großen und schmerzhaften Leberschwellung die Atembewegung aus zufuhren so erscheint es berechtigt in diesem Falle die Blutdruck steigerung dadurch zu erklaren daß Überfullung und Druck im ganzen Venensystem fur das aus den Kapillaren zufließende Blut einen stark erhöhten Widerstand bedeuteten Es ware dann auch nicht der Name Hochdruckstauung sondern die Bezeichnung Stauungshochdruck zu verwenden

Gesteigerte Herztatigkeit als Ursache von Blutdrucksteigerung Gesteigerte Herztatigkeit in physiologischem Sinne bedeutet das Ver arbeiten einer größeren Blutmenge in der Zeiteinheit An dieser Steige rung *ist der ganze Kreislauf beteiligt denn sie kann nur zustande* kommen durch eine Beschleunigung der Stromgeschwindigkeit oder durch das In Zirkulation Setzen eines größeren Quantums Blutes Phy siologisch werden meistens wohl beide Faktoren zusammenarbeiten

Zum Studium dieses wichtigen Problems ist in den letzten Jahren der einfache Arbeitsversuch als Grundlage genommen worden Namentlich der Übertritt aus der Ruhe zur körperlichen Tatigkeit kann uns die wichtigsten Aufschlusse uber die hierbei stattfindenden Vorgange geben

In der Ruhe mit ihrem geringen Sauerstoffbedarf ist durch weise Regulierung der Kreislauf auf ein entsprechendes Minimum herab

gesetzt das heißt daß bei allgemein herabgesetzter Kreislaufgeschwindigkeit *Herz und Lungen in der Zeiteinheit eine geringere Blutmenge* aus der Peripherie zugeführt wird

Fangt jetzt eine körperliche also muskulare Arbeit an so setzen folgende Vorgange ein Herzfrequenz Minutenvolumen und Blutdruck steigen an Eine erhöhte Zufuhr von Blut zum Herzen welche eine Bedingung fur ein großeres Minutenvolumen ist wird nachweisbar Zu diesem Zwecke wird Blut das in erweiterten Gebieten langsam floß durch Gefaßverengerung in die großen Verkehrsbahnen geworfen Zu gleicher Zeit aber erhöhen sich als Folge der Mehrarbeit seitens des Herzens und der Muskeln der Energieverbrauch die Sauerstoffaufnahme die Kohlensaureabgabe die Atemfrequenz die Atemtiefe der respiratorische Quotient Samtliche Kurven dieser Vorgange steigen in dieser ersten Periode der Arbeit geradlinig an und das Resultat ist eine sehr bedeutende *Inanspruchnahme aller dabei beteiligten Arbeitskrafte So unökonomisch* jedoch kann der Körper nicht weiterarbeiten nach mehreren Minuten kommt der Augenblick in welchem alle Kurven in verschiedener Geschwindigkeit absinken vor allem sinkt der gesteigerte Blutdruck auf normales oder wenig erhöhtes Niveau ab Ein Depressorreflex erweitert die noch auf den bescheidenen Ruhezustand eingestellten Arteriolen infolgedessen kann die unter höheren Druck gestellte gestaute Aorta ihren vergrößerten Inhalt in die Peripherie abfließen lassen Der zu uberwindende Widerstand fur das Herz wird herabgesetzt der ganze Kreislauf vermehrt und beschleunigt

Aus diesem gesetzmaßigen Verlauf der ersten Periode der Arbeitsversuche geht hervor daß die fur das Gelingen der Kreislaufsteigerung unentbehrliche Erweiterung des peripheren Kreislaufs auf sich warten laßt Man kann das die Latenz oder richtiger die physiologische Verspatung der depressorischen Reflexe nennen Es handelt sich dabei um eine vom physiologischen wie vom medizinisch praktischen Standpunkte aus recht wichtige Begebenheit Bei den verschiedensten Gelegenheiten begegnet man bei der Arbeit einer kurzen oder langeren Spanne Zeit die man am einfachsten als Anfangshemmung bezeichnen kann Jeder kennt aus eigener auch bescheidener sportlicher Betatigung diese Anfangshemmung in den ersten Minuten der Arbeit welche sich bis zu einem kritischen Augenblick dem toten Punkte steigern kann Die dann bald eintretende Erlösung aus diesem Zustand ist international bekannt als „second wind zweite Atmung Die Anfangshemmung erklart warum man eine sportliche Leistung langsam beginnt oder wenn es sich um Geschwindigkeitsrekorde handelt schon vorher dafür sorgt durch Vorubung den toten Punkt schon überwunden zu haben darum zwingt der *Jockei sein Pferd* erst sich warm zu laufen bevor er

den Wettlauf antritt Wie qualvoll eine allzu stark begonnene und fortgesetzte Anstrengung dem Sportsmann wird beschreibt Ewig (*11*) Bei seinen gesunden Ruderern kommt es beim Versuch den toten Punkt mit Gewalt zu uberwinden zu regelrecht dramatischen Augenblicken von Dyspnoe und Versagen wodurch die notwendige Maßigung erzwungen wird bis endlich die Lösung der Krise ein treten kann Bezeichnend ist die Tatsache daß in diesen Augenblicken die Bootsgeschwindigkeit — das Maß der geleisteten Arbeit — sinkt

Warum diese Latenz der Arbeitsfahigkeit diese so unerbitt liche Anfangshemmung? Die Antwort liefert uns der Vergleich mit der Dampfmaschine oder dem Explosionsmotor Der Maschinist sorgt bevor er die ruhende Maschine in Bewegung setzt erst fur *den nötigen Druck im Kessel und zufuhrenden Röhrensystem fur* ein größeres Druckgefalle (englisch head of pressure Druckkopf) zur Überwindung der Tragheit des stehenden Mechanismus (Siehe S 67 68) Ist die Maschine einmal in Bewegung sind die Rader in Schwung so genugt ein geringerer Druck um das Werk in Bewegung zu halten Offenbar ist eine gewisse Fullung und ein gewisser Druck in der Aorta vor allem notwendig dieser Aortendruck aber ist selbst wie man allgemein annimmt derjenige Faktor der den befreienden Depressorreflex auslöst Diejenigen Stellen von denen dieser Reflex ausgeht sind soweit jetzt bekannt die proximale Aorta und der Carotis sinus Der physiologische Reiz ist die Dehnung der Arterienwand von innen aus!

Die ursprungliche Heberdensche Angina pectoris Die Bedeutung der initialen Vorgange beim Arbeitsbeginn und des Auftretens einer aortalen Stauung durch das Nachhinken der peripheren Gefaßer weiterung ist auch deswegen fur den Praktiker eine wesentliche als es ein Krankheitsbild gibt weit verbreitet und viel umstritten wel chem diese Vorgange offenbar zugrunde liegen Es ist das klassische von W Heberden zuerst beschriebene und auf den Namen angina pectoris getaufte Auftreten von zum Stillstehen zwingenden Schmer zen beim Anfang der Bewegung Um Mißverstandnisse zu vermeiden (sie bestehen leider schon in allzu großer Zahl) sei darauf hingewie sen daß es sich im folgenden um die ursprungliche echte Form der Angina pectoris handelt die schweren Zustande von Koronar verschluß mit ihren anginösen Schmerzen gehören in eine andere Krankheitsrubrik wenn auch beide von analogen Schmerzen be gleitet werden und in der Krankengeschichte des einzelnen Patienten beide vorkommen können

Dieses Heberden sche Krankheitsbild ist kurz gefaßt folgendes

Der A p Patient erzahlt In der Puhe beschwerdefrei bemerkt er beim Beginn einer Arbeit (Gehen Gartenarbeit usw) schon nach kurzer Zeit (20 bis 100 Schritt) einen höchst unangenehmen Schmerz meist links vorne oben in der Brust oder in der Mitte des Sternums

(Krawattengegend) welcher nach links seltener nach rechts in die Schultern den Oberarm und meistens an der linken Seite bi in die Hand hinein ausstrahlt Nicht selten bohrt er sich durch bi in den Rucken (*intraskapular*) oder ungefahr den Karotiden entlang bis zum Ohr in die Zahne oder gar in den Hinterkopf Die eigent liche Herzgegend bleibt frei Dieser Schmerz zwingt den Patienten, stehen zu bleiben oder sein Gehtempo stark zu maßigen verschwindet dann kommt bei schnellerem Gehen aber wieder besonders wenn er vorher noch nicht ganzlich weg war Nicht selten bemerkt der Patient mit Verwunderung daß er nach vorsichtigem Überwinden dieser Anfangshemmungen imstande ist ohne Schmerz oder Er mudung einige Stunden in gutem Tempo zu marschieren Kurz atmig wird er bei seinen Schwierigkeiten nicht höchstens halt er wohl gezwungen beim Schmerz den Atem an

Die oberflachliche Ahnlichkeit dieser Beschwerden mit den Er scheinungen der oben beschriebenen Anfangshemmung mit ihrem toten Punkt und dem second wind wird zur völligen Wesens gleichheit wenn man den A p Patienten wahrend des Auftretens der Schmerzen sorgfaltig untersucht (was nicht immer leicht ist und gewöhnlich vernachlassigt wird) Vor allem ist keine Herz schwache vorhanden sondern eine zweifellos bedeutende Mehrarbeit des Herzens die Frequenz wird höher der Puls gespannt nicht selten mehr geschlangelt der zweite Aortenton wird bedeutend verstarkt der Blutdruck steigt zuweilen sehr stark und namentlich fehlt die Steigerung des Minimaldruckes (diastolischer Druck) nie Das aortale System befindet sich unter Hochdruck und Mehrfullung (starkere Schlangelung sichtbarer Arterien) Dyspnoe fehlt eher Atemhemmung

Dieses Bild zeigt nun wie es in mehreren Tausenden von Fallen genau untersucht und festgelegt wurde folgende Besonderheiten welche mit der größten Gesetzmaßigkeit auftreten und nur indi viduell verschiedene Nuancen zeigen

1 Der Schmerz kommt fruher und ist größer bei größerer Arbeit *In leichten Fallen gehört schon eine gewisse Anstrengung oder das* Vorhandensein der unten genannten sonstigen Umstande dazu den Schmerz hervorzurufen

2 Er kommt zu Beginn der Arbeit und laßt sich haufig ver meiden oder uberwinden durch ganz langsamen Übergang von der Ruhe in das definitive Arbeitstempo Der französische Ausdruck angine d effort ist nicht ganz richtig sie kommt schon vor der eigentlichen Anstrengung (angine de debut)

3 Das Auftreten der Schmerzen wird beschleunigt und ver starkt durch die Mahlzeit (den gefullten Magen) durch Kalte und andere Hautreize durch Aufregung und seelische Depres sion zuweilen auch nach dem Sichniederlegen

4. Der Schmerz nimmt ab oder verschwindet durch körperliche Ruhe, in leichten Fällen durch Einschränkung der Arbeit (ganz langsames Gehen), durch Wärme (warmes Zimmer, heiße Kataplasmen, warmes Handbad), psychische Beruhigung und durch das Nehmen von Nitroglyzerin oder das Einatmen von Amylnitrit. Die Nitrite sind auch imstande, dem Auftreten der Schmerzen vorzubeugen, wenn sie unmittelbar vor der Arbeit, auch vor einer aufregenden Beschäftigung genommen werden.

5. Adrenalin und Ephetonin können den anginösen Anfall hervorrufen.

6. Ein Versagen der linken Kammer kann den Schmerz verschwinden lassen.

7. Der künstliche Depressorreflex, Druck auf den Carotissinus, früher Vagusdruckversuch genannt, kann den Schmerz beseitigen oder wenigstens lindern.

Die Erklärung aller dieser wie von einem starren Gesetzesparagraphen vorgeschriebenen Besonderheiten fällt uns als reife Frucht in den Schoß, wenn wir annehmen, daß diese Form der Angina pectoris darauf beruht, daß die physiologische Anfangshemmung infolge Verspätung des Depressorreflexes mit ihrem toten Punkt und ihrer aortalen Stauung **schmerzhaft geworden** ist.

Vorhergeschickt sei, daß gerade das Schmerzhaftwerden selbst schon aller Wahrscheinlichkeit nach der Grund ist, warum der Angina pectoris-Anfall mit so viel höherem Druck einhergeht und so viel länger dauert als die physiologische Anfangshemmung und schließlich ein Extraeingreifen verlangt (vollkommenes Stillstehen, Nitroglyzerin usw., siehe unten), um den sich steigernden qualvollen Zustand zu beenden. Schmerz an sich und auch die fast nie fehlende Begleiterscheinung psychische Erregung rufen beide eine periphere Gefäßverengerung und eine Steigerung der Herztätigkeit hervor, die für uns meßbare Folge ist **Steigerung des Blutdrucks**. Dadurch kann sich ein Circulus vitiosus entwickeln: der Schmerz erhöht den Blutdruck, dieser steigert durch stärkere Belastung der Gefäßwand den Schmerz.

Zu 1. Ist die Arbeit größer, so werden diejenigen Faktoren, welche die Anfangshemmung verursachen, gesteigert, der Aortendruck entsprechend höher und die Schmerzen werden sich auch früher einstellen, weil derjenige Füllungsgrad und Druck, welche Schmerz hervorrufen, früher erreicht werden. Die Blutdruckmessung während des Anfalles weist aus, daß mit höherem Druck der Schmerz größer wird und umgekehrt.

Zu 2. Umgekehrt wird das vorsichtige Einsetzen der Arbeitsleistung ein langsames Ansteigen der verschiedenen Werte ermöglichen und den Druck nicht so hoch ansteigen lassen. Es kann dadurch auch ohne viele Beschwerden der Zeitpunkt der Depressorwirkung

erreicht werden der tote Punkt wird vermieden die größere Leistung wird allmahlich erreicht

Zu 3 Das Essen, die Mahlzeit und die erste Stunde der Verdauung steigern das Minutenvolumen Da außerdem sehr viel Blut zum Zwecke der Verdauung dem Magen zugefuhrt wird wird auch schon deswegen die Peripherie verengert sein Jedenfalls wird der Blutdruck gesteigert Blutdruck und Minutenvolumensteigerung von Arbeit und Mahlzeit addieren sich wie experimentell nachgewiesen wurde (Jarisch und Liljestrand *21*)

Kalte erhöht den Blutdruck infolge Verengerung des Hautgefaßgebietes (erhöhter Widerstand) Dieser Umstand macht sich bei den meisten A p Patienten sehr unangenehm bemerkbar Schon beim Hinaustreten in die kalte Luft (aus warmem Zimmer Theater Kino Kaffeehaus heißem Eisenbahnkupee) packt sie ein Schmerz der sie daran hindert den Heimweg anzutreten

Aufregungen, seelische Affekte schlechte Stimmung besonders wie wir sahen auch Schmerz tonisieren den peripheren Kreislauf verengern ihn wohl auch (Erblassen) so daß dieser sich langer dem depressorischen Einfluß widersetzt Außerdem fuhren diese Faktoren in vielen Fallen zu erhöhter Herztatigkeit (starkes Herzklopfen Schlagen der Arterien!)

Beim Niederlegen strömt mehr Blut durch die Vena cava inferior und die Lebervenen zum Herzen ab wodurch das Minutenvolumen wenigstens auf kurze Zeit erhöht wird Besonders bei korpulenten Personen ist dies der Fall und dort wo die Venen des Bauches und der unteren Extremitaten stark gefullt sind

Körperliche Ruhe psychische Beruhigung beendigen die Mehrarbeit des Herzens und den erhöhten Gefaßtonus und verursachen dadurch ein fast augenblickliches Nachlassen der Schmerzen Immer wieder hört man vom kalteempfindlichen Anginiker wie beim Eintreten in das vertraute warme Wohnzimmer der Schmerz und jedes Unbehagen von ihm abfallen Das Nitroglyzerin verscheucht den Schmerz mit fast nie versagender Sicherheit Dieses Mittel ist die größte Wohltat fur Tausende von leidenden Menschen die dafur dem Pharmakologen Lauder Brunton zu danken haben Es ist unser einziger machtiger Faktor zur sofortigen Erweiterung von Arteriolen und Kapillaren den wir bis jetzt besitzen Die gunstige Wirkung ergibt sich aus dem hier vorgebrachten Mechanismus des anginösen Schmerzes der Depressoreinfluß wird sofort und machtig in Tatigkeit gesetzt *Wie sehr die Analogie von physiologischer* Anfangshemmung und ambulatorischer Angina pectoris wirklich besteht geht auch daraus hervor daß durch das Nehmen des Mittels unmittelbar vor dem physiologischen Arbeitsversuch und vor der körperlichen oder geistigen Arbeit vor dem Hinaustreten in die Kalte (besonders auch z B vor dem Koitus) sowohl die physiologi-

Anfangshemmung mit ihrem toten Punkte als auch das Auftreten der Anginaschmerzen verhindert werden.

Die günstige Wirkung der Lösung eines hypothetischen Koronararterienkrampfes zuzuschreiben, ist nicht zulässig, wie schon gesagt wurde, der Koronarkrampf ruft Herzschwäche und Blutdrucksenkung hervor, *im Anginaanfall* jedoch leistet das Herz eine bedeutende Mehrarbeit und steigert den Blutdruck. Auch ein anderer, altbekannter Ausspruch, welcher nicht selten als Argument aus dem Stalle geholt wird, ist, daß der Schmerz das wichtigste Warnungssignal, die rote Laterne vor der Bahnkreuzung wäre und nicht aus dem Wege geschafft werden darf. Das Gegenteil ist der Fall, der Schmerz ist derjenige Faktor, der dem Depressorreflex des Angina-Anfalls entgegenarbeitet (siehe oben). Jeder Schmerz, dem vorgebeugt wird, ist ein Gewinn für den Patienten, weil unerwünschte Mehrarbeit des Herzens und Steigerung des Blutdrucks vermieden werden. Wer Augen hat zu sehen, der beobachte bis in die kleinsten Kleinigkeiten, was beim Patienten vorgeht, und lasse sich nicht von Schreibtischtheorien irreführen!

Zu 4. Nichts ist mehr geeignet, die oben verteidigten Anschauungen zu bestätigen, als der Adrenalinversuch. Es erschien uns immer als strengstens kontraindiziert, bei Anginapatienten, unter welchen Bedingungen auch, Adrenalin oder Ephedrin zu injizieren. Schon die klassischen Untersuchungen Pals über die Wirkung dieser Stoffe auf den splanchnischen Kreislauf zeigten die starke arterielle Stauung infolge der Verengerung der kleinsten Arterien, wozu eine erhöhte Herztätigkeit noch bedeutend beitragen kann. Es war uns auch nicht unbekannt, daß zuweilen nach Adrenalininjektion heftige Brustschmerzen von anginösem Charakter auftreten. Einer unserer Assistenten bekam bei einem Selbstversuch nach 1,75 ccm einer 1‰ Lösung einen so beängstigenden Druck und Schmerz auf der Brust mit Pulslosigkeit und Vorhofflimmern, daß er für sein Leben fürchten mußte (ein vollkommen gesunder junger Mann!). Trotzdem hat ein findiger Kopf den Epinephrinversuch zur Diagnose der Angina pectoris durchgeführt, und zwar mit schlagendem Erfolg. *Die Patienten bekamen sofort einen typischen Anfall.* Dieser „Test", der vor allem geeignet ist, den Arzt in unangenehmer Weise mit dem Strafrichter in Berührung zu bringen[1]), hat für uns den Vor

[1]) Im letzten Januarhefte einer bekannten medizinischen Zeitschrift wird ein Fall veröffentlicht, in welchem die subkutane Injektion von 1 ccm einer 1‰ Epinephrinlösung als diagnostische Probe auf Angina pectoris einen heftigen Anfall von Brustschmerzen von über 8 Stunden Dauer hervorrief. Kollaps, Bewußtlosigkeit mit Pulslosigkeit, Atemstillstand, Bradykardie und Blutdrucksenkung von 170/115 auf 80/60 mm und auf Myokardschaden deutender Ekg-Befund waren die Begleiterscheinungen. Der Autor gibt dann den naiven Ratschlag, mit diesen Versuchen sehr vorsichtig zu sein!

teil zu beweisen daß arterielle Stauung den Anginaanfall hervorrufen kann quod erat demonstrandum Eine pikante Besonderheit bietet dieser Versuch dadurch daß die adrenalinartig wirkenden Stoffe ausgesucht diejenigen Gifte sind welche die Koronararterien erweitern Wäre also der Anfall durch Koronarkrampf verursacht so mußte dieses Mittel den Anfall kupieren statt ihn hervorzurufen! (Siehe Seite 63)

Zu 5 Ein Versagen des linken Herzens kann ebenfalls den Schmerz beseitigen In diesem Falle nimmt die vom Herzen gelieferte nutzliche Arbeit das Minutenvolumen ab das aortale System wird nicht mehr so stark gefullt und die wenn auch noch nicht weit geöffnete Peripherie ist besser imstande in diesen geanderten Verhaltnissen die geringere Menge des zugefuhrten Blutes durch zulassen Die Tatsache selbst laßt sich jedenfalls nicht leugnen und kann von jedem Arzt leicht festgestellt werden In chronischen Fallen macht sich auf Grund von Koronarleiden oder sonstigen Myokard schaden auftretende Herzschwache dadurch bemerkbar daß der Schmerz abnimmt eventuell verschwindet dafur Dyspnoe welche bis jetzt fehlte auftritt Besonders im Anfall selbst kann das zur Mehr arbeit gezwungene linke Herz von dem dabei erhöhten Widerstand in der Aorta besiegt werden es entwickelt sich Lungenödem wo bei der Schmerz verschwindet (S 64 u ff)

Zu 6 Der Depressorreflex Wassermann beobachtete nach Karotisdruck eine sofortige Behebung von Lungenödem aber auch in Fallen von Dyspnoe (asthma cardiale) eine Linderung der Not In der Anginakrise wirkt er soweit eigene Erfahrung reicht wenn auch nicht bleibend kupierend so doch unzweifelhaft schmerzlin dernd

Bei regelmaßiger Durchfuhrung dieses Handgriffes kann man allerlei Besonder heiten beobachten Nach eigener noch zu geringer Erfahrung ist seine depres sorische blutdruckherabsetzende Wirkung beim Menschen keine sehr große Sie war fast nie vorhanden wenn nicht zugleich das Herz bedeutend verlangsamt wurde Außerdem senkt sich dabei der diastolische Blutdruck relativ viel weniger als der systolische oder gar nicht Das bringt auf den Gedanken daß vielleicht beim Men schen die den Reflex begleitende Verlangsamung (vielleicht auch vagale Schwächun) der Herztätigkeit durch vorubergehend vermindertes Minutenvolumen die wirkliche Ursache der Schmerzlinderung ist und die Erweiterung der Peripherie also die eigentliche depressorische Wirkung des Handgriffs von mehr untergeordneter Be deutung wäre

Fall 8 In dieser Richtung spricht auch eine sehr überraschende Beobachtung bei einem Patienten der während der Untersuchung (oder eigentlich — wie meistens — vor oder im ersten Beginn der Untersuchung — Aufregung des Patienten) einen starken Schmerzanfall mit allen genannten Erscheinungen bekam Als die Qual nicht enden wollte wurde vor der Nitroglyzerindarreichung der Karotisdruck ver sucht Dabei traten sehr starke Herzstillstände auf die sofort eine Erleichterung brachten jedoch nur so lange der Herzstillstand und die ersten langen

Diastolen dauerten nach den ersten Herzschlagen setzte der Schmerz sofort wieder ein Es war dem Beobachter und auch dem anwesenden Arzte ohne weiteres klar daß bei jedem Karotisdruck die Dauer der Schmerzbehebung der Dauer der starken Herzverlangsamung absolut entsprach

Der hier behandelte Stoff namentlich die aortale Stauung wurde nur deshalb so ausfuhrlich besprochen weil er ein noch ungeschriebenes Kapitel in der Lehre der Herz und Kreislaufkrankheiten darstellt und weil es fur den Praktiker wichtig erscheint eine klare Einsicht in die Vorgange im aortalen System zu gewinnen Er bekommt dadurch auch Gelegenheit bei seinen Patienten Beobachtungen uber die physiologische Anfangshemmung zu sammeln welche fur die Physiologie auch fur die Psychologie von wesentlicher Bedeutung sind Außere Umstande welche dem Gesunden kaum zum Bewußtsein kommen machen sich beim Anginiker bemerkbar es seien nur kaum merkbare Wegsteigung Wetter und Luftdruckveranderungen ein feuchter Nebel ein zu enges Kleidungsstuck genannt Jedoch auch psychische Vorstellungen und Zustande veranderte Stimmungslage ein schlechtes Gewissen Arger (W Osler nannte in dieser Rubrik speziell die Fakultatssitzung als Quelle!) Furcht (besonders vor der Herzkrankheit) Sorgen um die Familie auch ein nur voruberhuschender unangenehmer Gedanke lassen ob *durch Nerveneinfluß* oder durch Ausschwemmung von Adrenalin den Aortendruck schon ansteigen Irgendein schauererregender Vorgang oder ein starker musikalischer Eindruck der beim Gesunden vielleicht Gansehaut oder Kaltesensationen das Ruckgrat entlang verursacht ruft beim Anginiker Schmerz hervor Die oben beschriebene Möglichkeit den Aortendruck durch vorsichtigen Karotisdruck herabzusetzen oder wenigstens zu andern ist eine weitere Veranlassung die Anwendung *dieser Untersuchungsmethode dem wissenschaftlich interessierten* praktischen Arzt anzuempfehlen Jedoch soll der moderne Kreislaufforscher sich diese Sachen auch aneignen denn die Anfangshemmung infolge Latenz der depressorischen Reflexe mit ihrer Erweiterung der Arteriolen ist geeignet viel Unverstandliches zu erklaren So lassen sich die interessanten Befunde von Bansi und Grosscurth uber den Unterschied Trainierter und Untrainierter aus dem beim Geubten rascher und leichter auftretenden second *wind leicht deuten (3)*

Der Koronarkreislauf Da wo der arterielle Kreislauf dem linken Herzen entquillt an einer Stelle welche anatomisch und funktionell eigentlich noch dem Herzen angehört, hinter den Semilunarklappen des Aortenostiums versteckt und dadurch von dem ersten Anprall der ausgeworfenen Blutwelle nicht unmittelbar beruhrt entspringen die bei den den Herzmuskel versorgenden Kranzarterien Seine Aufgabe verleiht diesem kleinen Kreislaufabschnitt eine ganz besondere Bedeutung denn *mit dem Ausmaß der Blutversorgung* des Herzmuskels steht und

fällt der gesamte Kreislauf Auch in anderen Hinsichten nimmt der Koronarkreislauf eine exzeptionelle Stellung ein An keiner Stelle im Kreislauf ist der arterielle Seitendruck so hoch wie in diesem Anfangsstuck der Aorta und keine Arterienmundung steht unter einem solchen hohen Druck Die senkrechte Abzweigung der Koronaraste und die Einbettung des Anfangsstuckes der Art cor in die Wand der Aorta erscheinen geeignet diesem Übelstande des ubermaßigen Druckes wirksam zu begegnen Nachgewiesenermaßen wird bei jeder Systole der Blutstrom im Kapillargebiet der Kranzarterien durch die Herzmuskelkontraktion selbst gesperrt Das bringt mit sich daß bei jeder Systole der zufuhrende arterielle Abschnitt dieses Kreislaufs unter Sperrdruck gestellt wird (siehe S 44) Der stark geschlangelte Verlauf dieser Arterien wird durch die systolischen und diastolischen Größenveranderungen der Herzwand bedingt Schlangelung aber bedeutet größeren Widerstand im Gefaßbezirk[1]

Wahrscheinlich sind diese besonderen Arbeitsbedingungen mitschuldig an der bekannten Haufigkeit der sklerotischen Veranderungen der Kranzarterien auch bei solchen Kranken bei denen post mortem das ubrige arterielle System nicht oder viel weniger geschadigt gefunden wird Namentlich besteht eine große Neigung zur Fibrin und Thrombo enbildung welche auf nekrotische Prozesse der inneren Auskleidung der Gefaßwand hinweist Merkwurdigerweise bleibt bei selbst schwerer Mesaortitis luetica das Koronarsystem selbst meistens frei nur kommt es auf die Dauer zur Verengerung und zum Verschluß des Orifiziums ein Prozeß der sich aber noch in der Wand der Aorta abspielt

Die Koronarsklerose bildet ein wichtiges Hauptstuck der Lehre der Kreislaufinsuffizienz naturlich besonders aus dem Grunde weil der Motor des Kreislaufs selbst der Leidtragende ist und dadurch auch der ganze Kreislauf leidet Bei langsamer Entwicklung der Gefaßschadigung und verengerung besteht die Möglichkeit durch Kollateralenbildung dem Schaden entgegenzuarbeiten Es wird sogar bei Verschluß eines Koronarostiums nicht so sehr selten eine recht befriedigende Herzleistung festgestellt Die langsame Entwicklung des Leidens bringt naturlich eine allmahliche Anpassung des Patienten an die veranderten Verhaltnisse mit sich

Zweifellos ist die Koronarsklerose eine haufige Ursache von Myokardschwache und Herzinsuffizienz welche bei alteren Patienten nicht ganz selten auch schon vor dem vierten Dezennium ohne Klappenfehler und ohne sonstige Ursachen auch haufig in Verbindung mit arterieller Hypertonie auftritt Daß zur Diagnose anginöse Schmerzen vorhanden sein müßten war ein jetzt wohl allgemein erkannter Irrtum Von allen an Koronarsklerose gestorbenen obduzierten Fallen enthalt nach allen Statistiken nur ein kleiner Bruchteil der Anamnesen Angaben über Brustschmerzen In jüngster Zeit

hat Kretz (25) in dieser Beziehung wichtige Beweise für diese Auffassung gebracht

Ganz anders wirkt sich der plötzliche Verschluß von Koronararterien aus Früher haben wir dabei sicher allzuhäufig eine Embolie eines Koronarastes angenommen häufiger wird eine fortschreitende Thrombose angetroffen welche schließlich zur gänzlichen Verstopfung und zum schweren Anfall des Herzinfarktes führt Das äußerst schwere Krankheitsbild der ernsten Fälle ist allgemein bekannt nur wird es in der Welt mit verschiedenen Namen belegt Während in der angelsächsischen Welt namentlich im Vaterlande Heberdens, „coronary obstruction" von der alten „angina pectoris" (unserer ambulatorischen Form) getrennt wird wird am Kontinent der letztere Name mit besonderem Nachdruck auf den Koronarverschluß angewendet und zwar wegen der meistens vorhandenen anginös lokalisierten heftigsten Brustschmerzen Man hat sogar diese Form als die echte als „angina pectoris vera" betrachtet die ursprünglich unter diesem Namen von Heberden beschriebene Krankheit (siehe S 54 u ff) als die „ang spuria" bezeichnet Es wird noch nicht allgemein eingesehen daß durch diese Namensverwechslung auch eine Begriffsverwirrung entstanden ist die zu allerlei Mißverständnissen Veranlassung gibt Es ist daher dringend erwünscht dem richtigen Beispiel der englischen Literatur zu folgen und den Koronarverschluß auch als solchen zu benennen oder den Zustand als „Herzinfarkt" zu bezeichnen Hiermit ist das Wesentliche des hier geschilderten Zustandes richtig getroffen denn je nach dem mehr zentral oder peripher gelegenen Koronarverschluß wird ein größerer oder ein kleinerer Teil des Herzmuskels blutlos Dementsprechend werden auch die übrigen Folgezustände mehr oder weniger ausgeprägt sein schwache frequente Herztätigkeit kleiner weicher Puls starke Senkung des Blutdrucks allgemeine Kreislaufschwäche Wahrscheinlich treten auch vom Zentralorgan des Kreislaufs ausgelöste reflektorische Wirkungen ein welche dem Kreislaufsbild nicht selten den Charakter des „Schocks" verleihen (siehe S 41)

Es ist eine wichtige vielleicht noch zu wenig kritisch umstrittene Frage ob neben diesen anatomischen Vorgängen mit ihren schweren Folgeerscheinungen auch funktionelle Störungen des Koronarkreislaufs ein häufiges Vorkommnis bilden Im allgemeinen wird diese Frage mit Nachdruck bejahend beantwortet Trotzdem sind unsere wirklichen Kenntnisse auf diesem Gebiete äußerst dürftig Erst in den letzten Jahren haben die Untersuchungen Anrep s und seiner Mitarbeiter Licht gebracht jedoch auch die großen Schwierigkeiten der Beurteilung ihrer Resultate stark betont Die Koronararterien sind was Füllung und Druck betrifft größtenteils den Verhältnissen im Anfangsteile der Aorta untergeordnet bei hohem Druck werden sie erweitert und führen mehr Blut bei sinkendem Druck tritt die ent

gegengesetzte Wirkung ein Auch sind sie der Kraft und dem Ausmaß der systolischen Herzmuskelkontraktion insoweit unterworfen als eine kräftige Kontraktion von längerer Dauer die systolische Sperre (siehe oben) verstärkt eine schwächere und kürzere Kontraktion die Sperre vermindert und auch mehr Blut durchläßt Infolge dieser im Experiment sehr wechselnden Faktoren ist es ungemein schwer die reinen Vasomotoreneffekte aus dem Gesamteffekt herauszuschälen So viel scheint jetzt festzustehen daß im Gegensatz zum sonstigen Gefäßapparat der Sympathikus die Koronargefäße erweitert vagische Einflüsse eine Verengerung hervorrufen Dem entspricht auch die bekannte Tatsache daß Adrenalin erweiternd Pituitrin verengernd wirkt[1])

Diese Sachlage ist von großer Bedeutung für die Theorie der Angina pectoris Da die oben ausführlich geschilderten Symptome wiederholt bei solchen Angina Patienten vorkommen welche durch ein langes Leben oder durch den Obduktionsbefund bewiesen nicht an Koronar verengerung gelitten zu haben hat man angenommen daß es sich in diesen Fällen um *Koronarkrampf* gehandelt hätte Da man von der Vorstellung der Schmerz sei die Folge einer Ischämie des Herzmuskels nicht abgehen wollte war man mit der Annahme eines Ischämie verursachenden Gefäßspasmus über die Schwierigkeiten glücklich hinweggekommen Mit dieser Auffassung hat sich der Arzt infolge ihrer immer wiederholten nur selten widersprochenen Darstellung so sehr vertraut gemacht daß er nicht leicht dazu kommt sich von ihr loszusagen Nichtsdestoweniger stimmt die Erklärung nicht Bei der Besprechung der aortalen Stauung und des Angina Anfalles wurde schon darauf hingewiesen daß das Herz im Anfall nicht geschwächt erscheint sondern *unzweifelhaft während der Schmerzperiode eine außerordentlich gesteigerte Arbeit leistet*

Es geht gegen den gesunden Verstand gerade in diesem Zustand einen Koronarkrampf mit verringerter Blutversorgung des Herz muskels anzunehmen Aus Liebe zur überlieferten Theorie glauben zu müssen daß es auch einen schwer schmerzhaften Gefäßkrampf ohne Beeinträchtigung der Blutversorgung des Herzens geben kann ist eine starke Zumutung Die neuesten Untersuchungen von *Goldenberg* und *Rothberger* (*13*) und von *Rösler* jedoch geben dem gesunden Verstand recht und scheinen vernichtend für die Ge faßkrampftheorie Durch Pitresin au gelöster Koronarkrampf hat eine katastrophale Senkung des arteriellen Blutdrucks zur Folge mit schwerster Herzschwäche und Daniederliegen des Kreislaufs

[1]) Auf eine gelegentlich der Harvey Feier in London (1928) gestellte mündliche Anfrage wie sich in gewissen klinischen Zuständen die Kranzarterien betragen müßten antwortete der hervorragend kritische Forscher daß es ihm einstweilen noch unmöglich wäre darüber Wesentliches auszusagen

gibt somit natürlich das Bild des Koronarverschlusses welches wir soeben kurz besprachen Der Anfall der Angina pectoris ist genau das Spiegelbild das Umgekehrte Die Koronarkrampftheorie wird also einstweilen aus den Betrachtungen über die Angina pectoris aus scheiden müssen um so mehr als der oben besprochene Adre nalin Versuch uns dazu im Interesse unserer Patienten zwingt

Die Wechselwirkung von Aorten- und Lungenstauung Nach unserer Wanderung stromaufwärts sind wir an unseren Ausgangs punkt zurückgekehrt Es gilt jetzt hier wieder anzuknüpfen um den Kreis zu schließen Tatsächlich haben wir die Beziehungen des arteriellen Hauptstammes zum linken Herzen schon wiederholt be rührt Trotzdem kann es nützlich sein noch einmal die Wechsel beziehungen zwischen den Gefäßgebieten stromauf und abwärts des linken Herzens kurz zusammenzufassen Solange die linke Kammer ihrer Aufgabe gewachsen bleibt spielen sich die ganzen Störungen des erhöhten arteriellen Widerstandes zwischen Kammer und Aorta ab In dem Augenblicke aber in welchem der linke Ven trikel in seiner Tätigkeit nachläßt findet die oben beschriebene Mitralisierung der Kreislaufstörung statt linker Vorhof Lungen kreislauf und rechte Kammer werden überlastet Die Wechsel wirkung aber besteht darin daß (ceteris paribus) in demselben Augen blicke das aortale System entlastet wird was sich durch Druck abfall und geringere Füllung dokumentiert Klinisch äußert sich das im Auftreten von Dyspnoe und Verringerung der Hochdruckerschei nungen namentlich auch durch Milderung oder Verschwinden der anginösen Schmerzen So willkommen letztere Tatsache dem Pa tienten sein mag meistens ist sie ein böses Zeichen genau so wie die Dekompensation der Aortenklappeninsuffizienz (S 9) und auch der dekompensierten Hypertonie ohne Angina Es mag sein daß durch vorsichtige Digitalisierung der Zustand sich noch halbwegs reparieren läßt im allgemeinen markiert dieser Vorgang den Anfang vom Ende oder wie S **Wassermann** es einmal nannte daß die Akten geschlossen werden

Es möge noch ein Beispiel aus den letzten Wochen folgen

Fall 9 L ♂ 62 Jahre

Typische leichte Angina pectoris ambulatoria Anfang vor 1½ Jahren nach einer leichten CO Vergiftung wobei heftiges Herzklopfen aufgetreten war Ziemlich sta tionärer Zustand nur bei stärkerer Bewegung zeigt sich der Schmerz Es ging auch eine Zeit von seelischen Aufregungen voran

25 IV 1929 **Blutdruck** 180/107 mm Hg Bei Schmerzmahnung während der Untersuchung auf 200/118 Hg ansteigend Verschrieben abwechselnd Chi nidin + **Papaverin** und **Theobromin** Als Palliativ **Nitroglyzerin**

17 VI 1929 Sofortiger Erfolg der ersten Kombination Theobromin wirkt eher schädlich! **Blutdruck** 155 162/100 Hg

18 IX 1929 Er kann bei geringen Chinidindosen ungestraft umhergehen

keine Dyspnoe kommt der Schmerz so wirkt 1/2 Tabl von 0 0005 Nitroglyzerin sofort Blutdruck 160/90 Hg

29 XI 1929 Weniger Schmerz jedoch Herzklopfen sein Arzt hat ihm Digitalis verschrieben Der Puls ist frequent (108 p m) der Blutdruck auf 133/90 Hg heruntergegangen! Verdacht auf beginnende Myokardschwache Digitalis fortgesetzt

22 VII 1930 Er hat gar keinen Schmerz mehr gehabt klagte aber uber Kurzatmigkeit beim Gehen Gestern spat abends im Bett schwerer Anfall von heftigsten prakardialen Schmerzen ohne Ausstrahlung vollkommener Verfall konnte nicht aus dem Bette kommen Puls weich 110—120 p m fast unfuhlbar Die Schmerzen klingen ab dafur vollkommener Krafteverfall bis zum nach wenigen Tagen eintretenden Exitus Sehr hohe Atemfrequenz

Epikrise Erst ambulatorische Angina pectoris Abschwachung und Verschwinden der Schmerzen bei zunehmenden Symptomen der Herzschwache und sicherlich nicht durch die Therapie allein eintretende Blutdrucksenkung dafur Auftreten von Herzklopfen und Atemnot Zunehmende linksseitige Herzschwache Mit Rucksicht auf das arterielle Leiden Diagnose zunehmender Koronargefaßverengerung Digitalisbehandlung wird notwendig! Ende akuter Koronarverschluß mit den heftigen anginösen Schmerzen welche dabei noch einmal aufzutreten pflegen komplette Herzinsuffizienz Exitus

Hat man solche links dekompensierte Hypertoniker oder Anginapatienten vorher nicht gekannt so ist man nicht immer imstande die Diagnose zu stellen Man ist dann berechtigt an eine dekompensierte Hypertonie zu denken wenn zwar kein hoher systolischer Druck jedoch noch immer ein deutlich uber 100 erhöhter diastolischer Druck vorhanden ist

Dieser Vorgang kann sich bei allen aortalen Leiden auch sehr plötzlich abspielen Es ist dann gleich das erste Versagen von heftigster Atemnot begleitet Wir sprechen dann von Asthma cardiale oder von Oedema pulmonum Diese Zustande waren in den letzten Jahren Gegenstand eifrigsten Studiums und auch lebhafter Kontroversen in bezug auf ihre Genese Da zum richtigen Verstandnis einige Faktoren die in unser ceteris paribus nicht hineinpassen zur Sprache kommen mussen wird auf dieses Problem spater zuruckgekommen werden

Zweiter Teil

„Ceteris non paribus"

Blicken wir auf unseren Weg zuruck so mag wohl festgestellt werden daß wir die vielen Strömungshindernisse eigentlich ohne große Muhe , genommen haben und daß ein gut Teil der Pathologie und Klinik der Herz und Kreislaufstörungen nicht nur besprochen sondern auch redlich erklart werden konnte Jedenfalls war die Grund lage der Erklarungen die feste Basis klinisch und experimentell fest gestellter Tatsachen Allerdings wurde vorsichtshalber der Vorbehalt des ceteris paribus immer wieder betont denn weder mit den dynamischen Gesetzen der Herztatigkeit noch mit den besprochenen Kompensierungsvorrichtungen und Wechselbeziehungen haben wir die vielen Faktoren der Kreislaufregulierung in normalem und krank haftem Zustande erschöpft Es sollen daher jetzt solche Faktoren besprochen werden welche in den Kreislaufmechanismus andernd eingreifen können es sei denn im Sinne einer Hilfe oder eines Schadens Es wird sich dann zeigen in welchen Punkten unsere Vorstellungen geandert werden mussen

Die mechanischen Hilfskrafte des Kreislaufs

Die Muskelarbeit Bei der Besprechung der gesteigerten Herz tatigkeit als Ursache von Blutdrucksteigerung (S 53) wurden die Vor gange beim Arbeitsversuch schon insoweit besprochen als sie die Fullung des arteriellen Systems betreffen Eine größere Zufuhr von Blut zum Herzen fuhrt dadurch daß ein gesundes Herz die ganze zugefuhrte Blutmenge restlos verarbeitet zu einer starkeren Fullung der Arterien und steigert bei entsprechender Erweiterung der Peri pherie die Kreislaufgröße als Ganzes bedeutend Eine erste Frage ist nun inwieweit die Muskeltatigkeit selbst wirksamen Anteil an dieser Steigerung der Zuruckfuhr des Blutes zum Herzen hat

Nach alter Auffassung können die in der Kontraktion dicker und harter werdenden Muskeln unmittelbar einen Druck auf benachbarte Venen ausuben die Venen werden dadurch entleert, was jedoch kraft der Venenklappen nur in der Richtung stromabwarts zum Herzen stattfinden kann Von größerer Bedeutung ist es wahrscheinlich daß bei jeder Kontraktion die gefullten Kapillaren im Muskel aus gepreßt werden und sich ebenfalls in die Venen entleeren Krogh

(26) bemerkt dazu daß da Muskelkontraktionen gewöhnlich mehr oder weniger regelmäßig mit Erschlaffungen abwechseln das Klappensystem aus den Venen jedes Muskels eine sehr wirksame Pumpe macht die fur niedrigen Druck in den Muskelkapillaren sorgt Von diesen blutfördernden Mechanismen der Muskeltatigkeit selbst machen wir einen nutzlichen Gebrauch wenn wir beim Ader laß am Arm kraftige Kontraktionen der Armmuskulatur machen lassen damit mehr Blut aus den Venen fließt Übrigens wissen wir daß wenn der Gesamtorganismus oder einzelne Organe in Funktion treten die Kreislaufgröße in diesen Gebieten gesteigert wird wobei naturlich so viel Blut abfließt als zugefuhrt wird Ist einmal diese Kreislaufsteigerung und die dafur nötige Gefaßerweiterung in der Peripherie zustande gekommen so kann in angemessenem Tempo eine regelmaßige besonders eine rhythmische Arbeit Gehen Steigen Hacken eine sportliche Betatigung was man nur will ohne Erschöp fung stundenlang fortgesetzt werden Die Erfahrung und auch der gesunde Verstand sprechen dafur daß eine fortgesetzte Arbeit nicht einen Schaden sondern einen bedeutenden Vorteil fur die Erhaltung des Kreislaufapparates mit sich bringt!

Das Schwungrad des Kreislaufs Auf der Suche nach Energiequellen fur den Kreislauf außerhalb des Herzens ist man auf den Gedanken gekommen welch große Energie und treibende Kraft der bei der Arbeit in großer Geschwindigkeit kreisenden Blutmenge innewohnt So wie das Schwungrad durch den Motor selbst in Bewegung gesetzt imstande ist die ihm mitgeteilte Bewegung zur Förde rung der Gleichmaßigkeit bei intermittierender Kraftentwicklung zu verwenden und so zur ökonomischen Ge taltung der Arbeit der Maschine kraftig mitzuarbeiten so soll auch das kreisende Blut im stande sein die ihm vom Herzen mitgeteilte Bewegung mit seiner ganzen Masse (mehrere Kilogramm schwer) fortzusetzen Es wurde auch die Meinung ausgesprochen daß dieser Schwung des zuströmenden Blutes sogar dem Herzen den Antrieb gibt wobei letzteres seinerseits nur wenig Energie zu verschwenden brauche um dem durchfließenden Blutstrom neuen Schwung zu verleihen Wenn auch die e Vorstellung nicht in allen Punkten anwendbar ist i t doch zweifellos die Blut zufuhr der Vater des Minutenvolumens und es erscheint durchaus berechtigt diesen hamodynamischen Faktor wenigstens in Rechnung zu ziehen Einige der oben schon genannten Erscheinungen kommen mit dieser Hilfe zweifellos unserem Verstandnis naher Wenn man nämlich eine in Schwung befindliche körperliche Arbeit unterbricht so kommt dadurch das Schwungrad wohl nicht zum Stillstand es nimmt aber bedeutend an Tourenzahl ab Bei erneuertem Aufnehmen der Arbeit muß erst die Drehgeschwindigkeit wieder aufgebracht werden Offenbar hat auch durch die Unterbrechung infolge der Ab nahme der Menge des zirkulierenden Blutes die Peripher

verengert der tote Punkt muß wieder überwunden werden Wie sehr wir es hier mit rein physiologischen Vorgangen zu tun haben die aber zur Erklarung pathologischer Zustande unerlaßlich sind (siehe das Kapitel Angina pectoris) mögen einige Beispiele zeigen

Fall 10 Ein Bildhauer guter Dreißiger mit riesigen Muskeln und gesundem Herzen meißelt selbst seine künstlerischen Visionen aus dem harten Marmor eine außerordentlich schwere Arbeit Wenn er morgens früh *frisch* angefangen hat muß er nach einigen Minuten den schweren Hammer sinken lassen es geht noch nicht Langsam wieder *anfangend* überwindet er den toten Punkt *kommt in Schwung* und kann 2½ bis 3 Stunden ununterbrochen arbeiten Wenn er aber Besuch bekommt von dem Gerüst herunter steigt und nun auch nur 5 Minuten dem Besucher zu hören muß ist er außer Schwung geraten Fängt er wieder an so muß er die gleiche Erfahrung machen wie beim frühmorgendlichen Beginn

Oder folg nder anonymer Fall Ein ruhiger Berggeher steigt allein oder in Gesell schaft eines ebenbürtigen Kollegen ohne jede Schwierigkeit 3 Stunden lang bergauf fühlt sich oben angelangt außerordentlich frisch und nicht im geringsten er schöpft Geht er aber mit einem Ungeübten der nicht mitkann und muß er höflich keitshalber immer wieder stehen bleiben so wird er sich bald wie gelähmt fühlen und der Anstieg kostet ihn viel mehr Zeit und Mühe infolge der immer wiederkehren den Hemmungen er kommt nicht in Schwung!

Hierher gehören auch diej nigen Anginapatienten *welche morgens früh* beim ersten Aufstehen und den ersten Handlungen der Toilette häufig schon beim Sich im Bette Aufrichten mit *großer* Regelmäßigkeit ihre Schmerzen bekommen *Das Schwungrad* ist noch nicht in Schwung war im Schlafe sogar mit *verminderter* Masse (Blutmenge) auch halbwegs eingeschlafen daher die größere Arbeit *es* wieder in Gang zu setzen

Aus diesen einfachen Erfahrungen *soll* der Arzt seine Konse quenzen ziehen Es gibt kein besser wirksames und natürlicheres Mittel zur Förderung des Kreislaufs speziell der peripheren Distrikte als ausgiebige Bewegung Wer die Leistungsfähigkeit seines Kreislauf apparates sich bis ins hohe Alter erhalten will der gehe bis er schwitzt und arbeite bis an die Grenzen der Leistungsfähigkeit *Er* wird seine Peripherie offen erhalten wie der Arbeiter und der Landmann die von der Angina pectoris verschont bleiben

Auch für unsere rekompensierten Herzpatienten ist a u f d i e D a u e r nichts so schädlich wie der Strecksessel Angemessene und gut dosiert gesteigerte Bewegung ist dringendst indiziert Es soll nach und nach die Bewegung bis zur bedachtsamen Überwindung des toten Punktes geführt werden bis zum *Warmlaufen* um das Herz ohne Anstrengung allmählich zu *trainieren* Wie recht hatte O e r t e l mit seinen Bewegungsvorschriften!

Auch das örtliche Kreislaufhindernis in den Arterien (Embolie) kann manchmal durch steigende Bewegungsübung beeinflußt werden Es genüge hier die kurze Feststellung daß man mit allen sonstigen physikalischen Mitteln Wechselbädern heißen Prozeduren Medi kamenten und der dadurch erzeugten p a s s i v e n Hyperämie nicht ent fernt den Erfolg der a k t i v e n Durchblutung erreichen kann

Seit langer Zeit ist die **Massage** bei der Behandlung von örtlichen Kreislaufstörungen und namentlich bei sportlichen Dauerleistungen ein ungemein erfolgreiches geschätztes Mittel Eppinger hat vor nicht langer Zeit auf die vortreffliche Wirkung der Massage bei den gestörten Stoffwechselvorgängen der Herzinsuffizienz hingewiesen zweifellos ist das Wegschaffen nicht nur des angehäuften Muskelwassers sondern auch der Stoffwechselprodukte das Offenhalten der Kapillaren im Muskel bei Patienten welche sich noch nicht bewegen können von allergrößter Bedeutung Derjenige aber der sich schon wieder bewegen kann soll außerdem die dosierte Arbeit die ihm noch ganz andere Vorteile für den Gesamtkreislauf bringt wieder aufnehmen Und für den trägen Mitbürger wäre es unendlich viel besser er würde selbst Masseur werden als er ließe ich nur massieren

Die Atmung als Hilfskraft Bekanntlich können die Atembewegungen den Kreislauf fördern Die Einatmung steigert durch Erweiterung des Thorax die Negativität des Druckes im Brustraum und saugt nicht nur Luft in die Lungen sondern auch Blut in das Herz hinein Die gleichzeitige Erweiterung der Lungen fördert die Aufnahme von Blut aus dem rechten Herzen Außerdem wird der venöse Bauchkreislauf welcher mit seinen gewaltigen Kapillargebieten und weiten Venen am meisten Hilfe braucht durch die Kontraktion des Zwerchfells unter Druck gesetzt Hierdurch wird dieses Blut in die Richtung des rechten Herzens getrieben Die Leber welche besonders unter pathologischen Verhältnissen so viel Blut enthalten kann und auch physiologisch das ganze Blut der Intestina aufzunehmen und weiterzuleiten hat wird vom Zwerchfell das sie wie eine mit Muskeln versehene Haube umgibt mehr oder weniger ausgepreßt und wenigstens teilweise entleert Tatsächlich besitzt der Atemmechanismus Saug und Pumpwirkung eine Doppelfunktion welche dem Herzen nicht zugesprochen werden kann

Sowohl in normalen als in pathologischen Zuständen ist die Hilfskraft welche die Luftpumpe der Blutpumpe zur Verfügung stellt von nicht geringem Werte Die pathologischen Beziehungen zwischen Atmung und Kreislauf bilden ein sehr interessantes Kapitel der Lehre der Kreislaufstörungen (*31*) Mangelhafte Atmung besonders des Zwerchfells ist geeignet Überfüllung der Venen und Leberstauung hervorzurufen Pathologische Änderung des Atemmechanismus z B durch Thoraxmißbildungen oder bei starkem Volumen pulmonum auctum kann sogar die Atmung in einen kreislaufhemmenden Vorgang umwandeln

Die große Bedeutung der Atmung für die Zwecke des Kreislaufs wird nicht selten unterschätzt Eppinger findet daß ihr nur eine unterstützende kaum eine entscheidende Bedeutung zukommt wie wohl er den Wert für das Minutenvolumen auf höchstens ...

rechnete! Diese Zahl ist u E fur eine Hilfskraft eine sehr befrie *digende besonders wenn man in Rechnung zieht daß wir willkurlich* die Atembewegungen in größtem Ausmaß verstarken können! Es ist also wie Galen es ausdrucken wurde sehr vernunftig von der Natur ausgedacht daß gerade bei der körperlichen Arbeit die Atmung stark beschleunigt und vertieft wird und so das ihrige zur Kreislauf förderung beitragt Von diesem Umstande kann der Mensch einen sehr nutzlichen Gebrauch machen weil die gesamte Atemmuskulatur in unserem Machtbereich steht Wir können die beiden Phasen der Atmung verstarken und auch uns willkurlich den Typus (kostal oder diaphragmatisch) auswahlen Machtige Muskelgruppen stehen uns dazu zur Verfugung In pathologischen Zustanden lauft dabei die verstarkte Atembewegung meist zwangslaufig ab wir werden ven tiliert und atmen nicht mehr frei Trotzdem können wir aktiv sobald der Lufthunger uns bewußt wird kraftig mithelfen

Bei sportlicher Betatigung kann man wenn das Herz klopft und die Atmung zu keuchen anfangt folgenden Atemtypus anwenden Die Ausatmung soll mög lichst vertieft werden wozu die Hustenmuskulatur welche den ganzen Oberbauch zusammenpreßt vorzuglich geeignet ist das Zwerchfell wird in die Hohe getrie ben das Blutreservoir im Bauch unter Druck gestellt Die Einatmung erfolgt dann schon durch die Elastizitat der Rippen soll aktiv weiter vom Zwerchfell besorgt und tiefes Einatmen moglichst vermieden werden Besonders alteren Gebirglern sei dieser Atemmodus gegebenenfalls anempfohlen sie werden sich zweifellos von der *Macht auch der exspiratorischen Hilfskrafte des Kreislaufs uberzeugen vielleicht* könnte diese Hilfskraft auch am Krankenbette verwendet werden

Das periphere Herz Besitzen die Arterien oder gar die Kapillaren und Venen die Fahigkeit den Kreislauf zu fördern und mit eigener Energieverwendung die Herztatigkeit zu unterstutzen? Die Frage ist noch nicht als gelöst zu betrachten nichtsdestoweniger hat ihre Diskussion zweifellos dazu beigetragen die allgemeine Aufmerksam keit auf die Vorgange im großen Gefaßsystem uber welches der Kreis laufapparat verfugt zu lenken

Man kann uns dem Leser und dem Verfasser schwerlich den Vorwurf machen in unseren vorhergehenden Ausfuhrungen uns nicht schon recht ausgiebig mit dem was Hasebroek den „extrakardialen Kreislauf nennt beschaftigt zu haben Wir lernten schon eine ganze Reihe von Vorgangen kennen welche durch Blutverschiebung den Fullungszustand in bestimmten Bezirken andern Druck Strömungsgeschwindigkeit und Kreislaufgröße können dadurch im positiven wie im negativen Sinne beeinflußt werden Auch werden wir uns unten mit diesen und verwandten Gescheh nissen noch vielfach zu beschaftigen haben Man kann aber diese Regulierungsvorgange nicht ohne weiteres als generelle Förderung des ganzen Kreislaufs betrachten weil wie schon einmal hervorgehoben wurde in jedem geschlossenen Kreise ein Plus an der einen Stelle ein

Minus an einer anderen mit sich bringt Eher waren sie den Eingriffen gleichzusetzen welche der Elektriker im elektrischen Stromnetze vornimmt Widerstande Kurzschlusse Nebengleise Kondensatoren werden eingeschaltet jedoch ist und bleibt die Energiequelle das Dynamo Und was man an Volt gewinnt verliert man an Ampere Es mußten also ganz spezielle mechanische Hilfskrafte vorhanden sein um in einer Richtung wirkend den Kreislauf fördern zu können Am ehesten waren sie in den Venen mit ihren Klappen zu erwarten und zwar im Sinne der soeben beschriebenen Pumpwirkung der rhythmischen Muskeltatigkeit

Hasebroek (*15*) und andere sind der Meinung daß eine solche mechanische Hilfsarbeit durch die Arterien geleistet wird Es handelt sich um die Vorstellung daß regelmaßig und den Bedurfnissen entsprechend die Arterienwand durch rhythmische Kontraktion die Pulswelle weiterbefördert die Verengerung soll sich direkt der wegeilenden Pulswelle anschließen und dadurch die Höhe des Maximaldruckes, den wir an der Pulswelle messen steigern In diesem Punkte sind die Meinungen sehr geteilt Uns Arzten ware ein solcher Vorgang sehr willkommen weil uns eine solche Hilfskraft welche gelegentlich kompensierend eintreten könnte fur manchen etwas unverstandlichen Zustand eine Erklarung bieten könnte In einer der jungsten Arbeiten uber diesen Gegenstand sagt Wybauw (*34*) Wir glauben annehmen zu können daß die Arterien der Arbeit des Herzens eine wirksame Hilfe leisten Man höre denn auch auf in den Lehrbuchern der Herzpathologie das Herz als in stetem Kampfe gegen den arteriellen Widerstand der Gefaße darzustellen Statt Kampf ist offenkundige Zusammenarbeit da Kompensationen die immer bereit sind einzugreifen — Regulierungen von unendlicher Feinheit Ein sicherer Nachweis des erwahnten Vorganges scheint aus allen diesen Außerungen noch nicht hervorzugehen Es ist bezeichnend daß wahrend wir Ärzte uber diese Frage diskutieren die Physiologie mit ihrer strengen Kritik von Methoden und Erklarungsversuchen ein ganz anderes Wort spricht In einer vor kurzem erschienenen kritisch gestalteten Übersicht uber die Regulierung des Blutkreislaufs von W R Heß (*17* S 23) liest man daß das Mittel durch welches die Arterie in den Strömungsablauf eingreift die Widerstandsanderung durch Gefaßerweiterung und Gefaßverengerung ist Wir (Heß) fugen hinzu daß die Widerstandsanderung das einzige Mittel ist Die Annahme einer aktiven Förderung — im Sinne des sogenannten peripheren Herzens — ist aus physiologischen und physikalischen Grunden abzulehnen Also la mort sans phrase! Dieses Urteil grundet ich auf die namlichen Argumente die hier angefuhrt wurden Wir Ärzte werden daher einstweilen abwarten mussen welche Argumente im Laufe der Zeit angefuhrt werden

Wasserwechsel, Stoffwechsel und Kreislauf

Im Anfang war — der Stoffwechsel! Leben ist Aufnahme Verwendung zu eigenem Vorteil und Abgabe der abgebauten Stoffe Ob mit dieser Definition die genealogisch oberste Grenze des Lebens erreicht ist ob nicht auch die Vorgange im Atom schon Leben sind und die supponierte Grenze zwischen Lebendigem und Totem vielleicht gar nicht existiert ist ein Problem welches hier nicht erörtert werden soll Die Tatsachen Hypothesen Vorstellungen die uns hier zu beschaftigen haben sind schon kompliziert genug und in ihrer Beziehung zum Kreislauf noch so sehr Kinder des Augenblicks daß wir uns ohnedies nur mit Hauptsachen beschaftigen können und auch diese nur oberflachlich behandeln oder vielmehr andeuten werden

Es ist klar daß der Kreislaufapparat da ist um dem Stoffwechsel in den Geweben zu dienen das nötige stoffliche Material der Aufnahme und Verwendung zuzufuhren die Schlacken abzutransportieren und den Ausscheidungsorganen Lungen Nieren Darm Haut zu ubermitteln Er bewerkstelligt den Verkehr zwischen den einzelnen Kreislaufbezirken und den Organen manches was dem einen Organ Schlacke war wird auf diesem Wege an anderer Stelle noch zum Aufbau und zur weiteren Verwendung oder gar als physiologischer Reizfaktor weitergeleitet

Wasserwechsel und Stoffwechsel sind unzertrennlich verbunden denn das Wasser ist Lösungsmittel und Vehikulum der gelösten den Stoffwechsel tragenden Substanzen Der Transport findet nicht nur im Kreislaufapparat statt sondern zum Teil in den Geweben die Lymph und Chyluswege sind Hauptadern dieses Verkehrsnetzes Ein fortwahrender Austausch von Wasser und Stoffen zwischen Blut und Geweben findet statt und zweifellos sind es gewaltige Mengen Flussigkeit welche in dieser Weise die Grenzen des Kreislaufs uberschreiten und auch wieder Einlaß begehren Schon die allmachtigsten Funktionen des Organismus die Harnabsonderung die Produktion samtlicher Verdauungssafte viele andere Drusenfunktionen stellen große Anforderungen an den Kreislauf der allein imstande ist diese Wassermengen beizustellen Wieviel Blut muß nicht die betreffenden Organe wahrend ihrer Funktion durchfließen wenn man bedenkt daß die Wasserabgabe doch nur allmahlich stattfinden kann Auch mussen andere Stellen zu diesem Zwecke Wasser abgeben Beide Stoff und Wasserwechsel werden nur zum Teil auf Kosten der Kreislaufenergie abgegeben namlich da wo Filtration möglich ist Dieser Prozeß findet nur in den Kapillaren statt und wird durch Erweiterung dieser kleinsten Gefaße gefördert Histamin das von den Geweben selbst hervorgebrachte gefaßerweiternde Gift kann wie schon erörtert eine solche allgemeine oder lokale maximale

Gefäßerweiterung hervorrufen Die Kapillarwände werden dadurch mehr durchgängig und lassen das Wasser passieren Das geschieht in solchem Ausmaß daß das Blut dabei ein gut Teil seines Wassers verliert eingedickt wird verdurstet

Weitere Faktoren des Wasserwechsels sind die physikochemischen Prozesse und die biologischen Eigenschaften der Gewebszellen auch der Gewebe als Einheit welche Osmose kolloidale Quellung und Entquellung Sekretion beherrschen Wie bekannt sind diese Kräfte imstande große Quantitäten Energie zu speichern und zu spenden Es wäre daher von unserem Gesichtspunkte aus berechtigt zu fragen ob nicht dieses Hin und Her großer Wassermengen auch dem Kreislauf Energie zuführen einen Teil der Kosten des Kreislaufs auf sich nehmen könnte?

Das Herz — ein sekundäres Organ? Die weitestgehenden Schlußfolgerungen aus den oben kurz skizzierten Problemen hat M Mendelsohn gezogen und in einer kleinen Arbeit unter obenstehendem Titel veröffentlicht (*28*) Es fehlt im Original nur das Fragezeichen wofür die Emphase der Darstellung eher ein Ausrufungszeichen erhalten sollte! Mendelsohn hat erkannt daß die ursprünglichen die primären Kräfte welche den Kreislauf hervorbringen tiefere essentiellere sind als die einfache motorische Mechanik des Herzens dem dagegen in erster Linie die Aufgabe obliegt die aus diesen Kräften hervorgehende Blutbewegung zu einer kreisförmigen überall hinführenden zu gestalten und den Umlauf durch die Zumessung des jedesmal gleichen Blutquantums zu regulieren Neben die er regulatorischen Tätigkeit vollführt es erst sekundär auch noch die motorische Funktion und zwar innerhalb der Grenzen seines Könnens das nicht weiterreicht als bis zu den Kapillaren

Schon in diesem Anfang werden richtige Gedanken mit unrichtigen Argumenten zu stützen versucht Die beiden gesperrt gedruckten Behauptungen sind wenn sie auch wiederholt aufgestellt werden deshalb noch nicht berechtigt Das Quantum des zugemessenen Blutes wechselt immerfort ein Traum im Schlaf kann es schon steigern und der arterielle Puls kann sich bei physiologisch erweiterter Peripherie (Erwärmung eines Gliedes) bis in so herznahen Gefäßen wie den großen Armvenen bemerkbar machen So geht es nun weiter Anschließend sagt Mendelsohn Aller Kreislauf dient nur dem Stoffwechsel Stoffwechsel und Kreislauf sind eine untrennbare Einheit Man würde nun eher eine Verherrlichung des dem Stoffwechsel dienenden Herzens erwarten Hingegen wird mit einer an Vergewaltigung grenzenden Ungerechtigkeit die überall der Kritik zugänglich wäre die Bedeutung des Herzens seiner Dynamik seines nach seinem Dafürhalten höchst mangelhaften Mechanismus herabgesetzt Man braucht nicht solche Mittel um die gewaltige Bedeutung der Lebensprozesse auch für den Kreislauf ins Licht zu stellen Man könnte auch

noch sprechendere Beispiele als den Druck unter welchem die Epithelien von Niere und Drusen ihre Sekrete absondern, fur die in diesen Vorgangen gespeicherte Energie dartun Bei Portalvenensperre (Leberschrumpfung) wird die Aszitesflüssigkeit trotz des immer wachsenden Bauchdrucks unentwegt weiter in die Bauchhöhle gepreßt Ja alles Wasser im Körper wird zu diesem Zwecke einberufen so daß alle Gewebe schließlich verdursten wahrend sich ein gewaltiges Wasserreservoir im Bauche ausbildet Oder das Beispiel des perikarditischen Ergusses der sich auch bei stark sinkender Herzkraft immer vergrößert und schließlich den Motor des Kreislaufs selbst erdrosselt Wir werden an die alte Laminaria erinnert welche widerstandleistende Kanale beliebig erweitert oder an die durch Zelltatigkeit schwellende Baumwurzel welche Felsen spaltet

Was hier fur uns aus dieser trotz ihrer Übertreibung geistreichen Arbeit hervorgeht ist die Tatsache daß es noch ganz andere als nur **mechanische** Krafte und Hilfskrafte gibt welche bei der Beurteilung des Kreislaufs eine Rolle spielen können Ob diese Kräfte sich auch so auswirken wie **Mendelsohn** sich das vorstellt namlich als tatsachlich das Blut aus den Geweben in die Blutbahn stoßend immerfort und so fur den ganzen venösen Ruckfluß des Blutes zum Herzen verantwortlich zu machen sind (die Herztatigkeit soll sich ja nur bis zu den Kapillaren fuhlbar machen) ist eine andere Sache Diese Vorstellungen durften aber in einem dem ceteris non paribus *gewidmeten Kapitel nicht unerwahnt bleiben* Auch hier wendet man wohl mit Recht ein daß die ins Blut gestoßenen Flussigkeitsmengen an anderer Stelle resorbiert werden, also auch Energien verbrauchen

Der Wasserwechsel Wasserabgabe an die Gewebe und Wiederaufnahme ins Blut sind zusammen mit den ausscheidenden Funktionen der Niere die immer tatigen Vorgange des **Wasserwechsels** Ihr zweckmaßiger Ablauf laßt auf fein eingestellte Regulierung schließen Teil dieser Regulierung müßte auch die Beistellung solcher Gewebsformen oder Organe sein welche das zugefuhrte Wasser speichern können um es auf höheren Befehl wieder zu liquidieren Dieses Postulat wurde um so zwingender als die anfangs sehr erstaunlich anmutende Tatsache bekannt wurde daß die Einverleibung großer Wassermengen wie sie bei der Aufnahme von Nahrung und Getranken physiologisch die Regel ist keine Vermehrung des Blutwassers keine Hydramie hervorzurufen braucht Wenn schon so laßt sich doch ein sehr rasches Verschwinden des Wassers aus dem Blute beobachten **ohne daß eine gleichzeitige Erhöhung der Diurese stattfande** Der physiologisch entsprechende Wassergehalt des Blutes wird offenbar eben o sorgfaltig gewahrt wie Wasserstoffionenkonzentration Zuckergehalt usw Wichtig ist, daß der Weg auf welchem das Wasser eingefuhrt wird per os oder parenteral in dieser Beziehung

einen Unterschied macht An dieser Regulierung des Wasserkreislaufs der natürlich den Rahmen des Blutkreislaufs weit überschreitet nehmen zahllose nach und nach bekannt gewordene Faktoren teil Regulierungszentralen von höherer und niederer Ordnung werden im Nervensystem angenommen so auch Hormone verschiedenster Herkunft (Hypophyse Schilddrüse usw) welche häufig in entgegengesetzter Wirkung die Quellung und Entquellung der Gewebe sowie die Nierentätigkeit beeinflussen Uns muß besonders interessieren daß auch die Leber zu den Speicherorganen gehört So schwillt nach einer Injektion hypertonischer Glukoselösung beim Hund die Leber infolge Zucker und Wasseraufnahme seitens des Parenchyms mächtig an (Mautner) Die Wasserspeicherung kann auch infolge eines ebenfalls hormonal auslösbaren Vorgangs von klinischer Bedeutung zustande kommen Die Lebervenen besitzen beim Hund wahrscheinlich auch beim Menschen knapp vor ihrer Einmündung in die Vena cava inferior eine Art Klappen glattmuskelige Sperrvorrichtungen (Pick) *welche durch ihre Verengerung (Histamin* Pituitrin) das Abfließen des Blutes aus der Leber behindern können Die dadurch entstehende größere Leberfüllung und der höhere Druck in den Venen lassen ebenfalls die Leber stark anschwellen und fördern das Austreten von Wasser in das Leberparenchym in so hohem Grade daß das Blut wasserärmer wird Das Ganze muß ein Bild geben welches einer kardialen Leberstauung täuschend ähnlich sieht das soll uns am Krankenbette ein Grund sein diese Möglichkeit nicht aus dem Auge zu verlieren Wichtiger aber erscheint uns folgende Überlegung Wenn bei dieser Lebervenensperre starke Überfüllung und Druck in den Leberkapillaren Austreiben von Wasser ins Leberparenchym eintreten ist es erlaubt den gleichen Vorgang auch da anzunehmen wo die Sperre sich eine Station tiefer stromabwärts nämlich im erkrankten rechten Herzen befindet Auch hierbei kommt es zu gewaltiger Blutanhäufung man denke an die Trikuspidalinsuffizienz mit ihrem unter Kammerdruck ausgeworfenen positiven Leberpuls und die gewaltig erweiterten Lebergefäße welche später bei der Autopsie gefunden werden Es wäre also durchaus berechtigt anzunehmen daß die mächtige kardiale Leberschwellung nicht ausschließlich auf Blutstauung zurückzuführen sei sondern auch teilweise auf starker Wasserstauung im Leberparenchym beruhen könnte Diese Annahme würde erklären daß die Salyrganbehandlung bei der das gespeicherte Gewebswasser gelockert und in Zirkulation gesetzt wird bei rein kardialer Stauung auch ohne gleichzeitige Digitalisbehandlung also ohne direkte Verbesserung der Herztätigkeit die Leber bedeutend abschwellen läßt Diese Behandlung ist daher auch eine vorzügliche Vorbereitung zur Digitaliskur tatsächlich verschafft uns diese kombinierte Behandlung Erfolge wie sie in früherer Zeit unerreichbar waren

Es wäre nun vollkommen verfehlt jede Leberstauung beim Menschen als nicht einfach kardial sondern als durch Wasserspeicherung im Leberparenchym entstanden zu betrachten Beide Faktoren sollen besonders auch auf experimentellem Wege auf ihr gegenseitiges Verhaltnis untersucht werden Dazu sollen dann neben den von Pick u a aufgedeckten Wechselwirkungen zwischen Leber und Niere auch die auf Seite 15 u ff beschriebenen Wechselwirkungen zwischen Leberstauung und Nierenstauung zu berucksichtigen sein[1])

Das Ödem und seine Entstehung gehören naturlich vor allem zum Gebiete des Wasserwechsels Das kardiale Ödem mit seiner großen Beweglichkeit im Gewebe seiner Lokalisation in den am meisten gestauten Gebieten und sein Kommen und Gehen innerhalb gewisser Grenzen parallel mit der Leistungsfahigkeit des Herzens wurde schon S 15 u ff beschrieben Wir denken uns dieses Ödem durch einfachen Austritt von Blutwasser durch die Kapillarwande in die Gewebszellen und Lymphwege entstanden Andererseits heißt es und wird es mit Versuchen gestutzt daß nur bei Erkrankung der Gefaßwande ein Ödem entsteht Man könnte sich beim Stauungsödem also vorstellen daß Überfullung und Druck die Kapillarwande erst schadigen mussen und dadurch erst Ödeme verursachen Es steckt in dieser landlaufigen Auffassung insofern eine gewisse Unlogik als es ja zur physiologischen Funktion der Kapillarwand gehört dem Blutwasser den Durchtritt zu gewahren Also wozu noch die Schadigung annehmen? Oder handelt es sich nur um quantitative Unterschiede? Unter durchaus physiologischen Bedingungen ruft Histamin eine Kapillarerweiterung hervor welche so große Mengen Wassers austreten laßt daß die Gewebe allerdings vorubergehend deutlich anschwellen

Eine etwas andere Ursache des Ödems kann auch die Behinderung der Abgabe des uberschussig vorhandenen Gewebswassers **an das Kapillarblut** sein Ist dies ein physiologisch ebenso notwendiger Vorgang wie das Austreten in die Gewebe? Naturlich spielt hier das Verhaltnis des osmotischen Druckes von Blut und Gewebeflussigkeit eine bedeutende wahrscheinlich die Hauptrolle Die dritte Möglichkeit ist daß die Gewebszellen selbst das Wasser festhalten oder das bei der Zellfunktion entstehende Wasser (Oxydationswasser) durch kolloide Bindung nicht mehr loswerden können

Fur die Entstehung der kardialen Ödeme werden wir wohl die richtige Wahl treffen wenn wir annehmen daß erstens mehr Wasser aus den durch Stauung erweiterten Kapillaren austritt zweitens das Abfließen von Gewebswasser ins Blut durch erhöhten Kapillardruck sehr behindert wird hieraus resultiert naturlich Anhaufung im Gewebe von nicht gebundenem sondern in den Gewebsspalten liegen

[1]) Auf die neuesten Mitteilungen Zaks kann hier nur verwiesen werden (W kl W 1931)

dem beweglichem Wasser Die dritte Möglichkeit die Bindung ware fur andere Ödemformen zu verwenden in welchen der Kreislauf keine Rolle spielt also beim Myxödem bei Nierenleiden und sonstigen mit Gewebsschaden einhergehenden Krankheiten In diesen Fallen beeinflußt Behandlung des Herzens die Schwellung nicht Auch sind es dabei nicht selten nur bestimmte Gewebsformen welche von der Quellung betroffen werden

Experimente haben gezeigt welche erstaunlich große Mengen von Blut und Wasser in die Muskeln eintreten und dann verschwinden können eine Depot Leistung ersten Ranges Das mag nun ein physiologischer Vorgang sein es hangt jedoch von der Art der Wasserbindung und von ihrer Ursache ab inwieweit auch sehr bedenkliche Folgen auftreten können namentlich wenn auch der Herzmuskel daran teilnimmt Ein erstes Beispiel einer solchen gemeinsamen Quellung von Skelett und Herzmuskulatur bietet wie es scheint die Beriberi Krankheit eine tropische bei dem ausschließlichen Genuß von geschaltem Reis auftretende Krankheit In ihrem Anfangsstadium tritt bedeutende und lebensgefahrliche Herzschwache auf mit Erweiterung dieses Organes und als Hypertrophie betrachteter Verdickung der Herzwand (siehe Aalsmeer und Wenckebach *1*) Vielerlei Grunde fuhrten zur Überzeugung daß nicht Hypertrophie sondern Quellung des Herzmuskels vorliegt Diese Quellung geht im Experiment einher mit einer Schadigung ja sogar Aufhebung der Kontraktilitat die Querstreifung wird vernichtet die Verkurzungsmöglichkeit geht verloren (siehe S 30) In diesem selben Stadium der Krankheit kommt es auch zu starker derber Schwellung solcher Muskelgruppen welche die meiste Arbeit liefern Waden Brust Schulter Armmuskeln Beide Herz und Muskulatur verlieren diese Schwellung auf Darreichung von Reisschalenextrakt und anderen vitaminreichen Nahrungsmitteln wobei die Diurese bedeutend gesteigert ist Auch bei anderen Erkrankungen (Myxödem Pachitis usw) mag eine ahnliche Erklarung wohl das Ratsel der Herzvergrößerung und der resultierenden Kreislauferscheinungen lösen Diese scheinbar einfache Erklarung der eingetretenen Störungen aus Wasserretention erscheint weniger einfach wenn man erfahrt daß die Wasserbindung in den verschiedenen Krankheiten nur auf ganz verschiedene nur fur jede Krankheit spezifische Therapie antwortet also selbst auch durch eine ihr spezifische Ursache hervorgerufen wird Das Problem des Wasserwechsels birgt also eine große Anzahl von der Lösung harrenden Fragen Zieht man in Betracht daß das Wasser immerhin hauptsachlich nur das Vehikulum gelöster Substanzen ist so wird es klar daß nur die zugrunde liegenden Stoffwechselvorgange uns zu einem tieferen Verstandnis werden verhelfen können

Der Stoffwechsel bei Kreislaufinsuffizienz

Immer dringlicher ist in den letzten Jahrzehnten die Frage nach den Ursachen der ungenügenden Leistungsfähigkeit des Herzmuskels gestellt worden Daß die anatomischen Befunde nicht ausreichen um die Vorgänge im Leben zu erklären ist längst anerkannt was nicht sagen will daß man die pathologische Anatomie nicht eifrigst studieren soll! Wir sprachen und sprechen von funktionellen Störungen von Ermüdung Atonie Erschlaffung von Herz und Herzmuskelschwäche mangelhaftem Ernährungszustand und längst schon fiel das Wort vom schlechten Stoffwechsel im Herzmuskel Dem mangelhaften Ernährungszustand entsprach der Vorschlag als Brennmaterial zum Heizen des Myokardofens Traubenzucker zu verwenden und gegen ungenügende Gefäß und Zellfunktion die Einfuhr von Kalzium Phosphaten und Karbonaten Ein wichtiger Vorstoß zur Erkennung der chemischen Veränderungen am toten Material des gesamten Kreislaufapparates wurde vor kurzem von Kutschera Aichbergen (27) unternommen die Befunde auf die hier nicht eingegangen werden kann sind sehr ermutigend Begreiflicherweise ist aber der Stoffwechsel selbst nur am lebenden Organismus zu studieren Im großen Stile wurde das Problem am gesunden und am kranken Organismus von Eppinger aufgenommen mit dem Erfolg daß unsere experimentelle und klinische Literatur jetzt eine große Zahl von neuen Arbeitsmethoden Befunden und Erklärungsversuchen bringt Es ist einstweilen noch schwer das klinisch Brauchbare aus diesem Strom von neuen Gedanken herauszulesen auch weil gerade in uns hier interessierenden Fragen sich die Meinungen noch sehr widersprechen Einige Punkte welche zeigen in welcher Richtung gearbeitet wird und solche die zu den ceteris non paribus gehören sollen hier kurz erörtert werden

Die Ausnützung des im Blute zugeführten Sauerstoffs Diese für die Kreislaufforschung sehr wichtige Größe wird nach folgendem Prinzip berechnet

a) Der Sauerstoffverbrauch in der Zeiteinheit ist das Maß für den Gesamtgrundumsatz Er wird mit dem jetzt allgemein eingeführten Kroghschen Apparat bestimmt der z B zur Diagnose der Hyper und Hypothyreosen dem Arzt große Dienste leistet

b) Zur Berechnung der O_2 Abgabe aus dem Blute an die Gewebe wird erstens durch die Punktion einer beliebigen Arterie der O_2 Gehalt des arteriellen Blutes also bevor noch O_2 abgegeben wurde bestimmt Es gilt nun die gleiche Bestimmung im aus den Geweben wieder zum Herzen abströmenden Blute durchzuführen Da die verschiedenen Gefäßgebiete und Organe im Körper sehr verschiedene Mengen O_2 verbrauchen darf diese Bestimmung nur im zentralen venösen Blute stattfinden das wäre also im rechten Vorhof Man

mußte daher den rechten Vorhof punktieren Das ist in der letzten Zeit auch in hierzu geeigneten Fallen geschehen und zwar zur Kontrolle der bis jetzt gebrauchlichen Methode der gasanalytischen Untersuchung der geschlossenen (venösen) Alveolarluft mit Hilfe der Hillschen Formel Es ist jetzt wohl sicher daß auch bei dieser letzteren Methode brauchbare Werte gefunden wurden

c) Die O_2 Abgabe betragt ca 25% des Arterienwertes jedoch nur in der Ruhe wahrend körperlicher Arbeit wird wie wir sehen werden viel mehr Sauerstoff verbraucht

Fick schlug als erster vor durch diese gasanalytischen Untersuchungen das Minutenvolumen zu bestimmen Wenn man den Sauerstoffverbrauch der Versuchsperson (bestimmt mittels des Kroghschen Apparates) den O_2 Gehalt des arteriellen Blutes und den des gemischten Venenblutes kennt kann man durch folgende Rechnung das Minutenvolumen ermitteln das heißt diejenige Quantitat Blut welche sich in der Minute an der Sauerstoffabgabe beteiligt *hat*

$$\text{Minutenvolumen} = \frac{O_2 \text{ Verbrauch pro Min}}{O_2 \text{ Arterie} - O_2 \text{ gem Venenblut in Vol } \%}$$

Minuten- und Schlagvolumen Neben der prozentualen Sauerstoffausnutzung seitens der Gewebe lernen wir also auch die Blutmenge kennen welche in der Minute vom Herzen ausgeworfen wieder zum Herzen gefuhrt wurde und die Lunge passiert hat Diese Menge aber ist das schon wiederholt erwahnte Minutenvolumen also das Maß der vom Herzen nutzbringend geleisteten Arbeit Teilt man das Minutenvolumen durch die Schlagzahl des Herzens in der Minute so findet man den Wert des Einzelschlagvolumens Die drei genannten Größen machen es möglich die Herz und Kreislauftatigkeit beim gesunden Menschen und in verschiedenen Krankheitszustanden zu studieren in einer Weise wie dies fruher nur im Tierexperiment möglich war

Körperliche Arbeit steigert den Sauerstoffverbrauch Bei schwerer Arbeit kann sich der O_2 Verbrauch *bis auf das Achtfache steigern* Wurden dabei nur 25% des Blutsauerstoffes ausgenützt werden so mußte die Blutgeschwindigkeit entsprechend gesteigert und ein aufs Achtfache gestiegenes Minutenvolumen vom Herzen aufgebracht werden um den Bedarf zu decken was eine gewaltig gesteigerte Belastung von Herz und Gefaßen bedeuten wurde Dieser Übelstand wird offenbar durch eine bedeutende Vergrößerung der Sauerstoffausnutzung gemildert Das Wesen dieses Vorgangs in den Kapillaren denn nur diese kommen fur den Gasaustausch in Betracht ist noch nicht völlig klargestellt Wahrscheinlich spielt eine Erweiterung der Kapillaren dabei eine Rolle Sie bringt ein verlangsamtes Strömen des Blutes mit sich wodurch mehr Zeit fur die O_2 Abgabe gewonnen wird aber andererseits hätte sie den Nachteil

den Gesamtkreislauf zu verlangsamen während Beschleunigung dringend verlangt wird Bis vor kurzem hat man diese Kreislaufbeschleunigung daher als das einzige Mittel zur Erhöhung des Minutenvolumens betrachtet Besonders wichtig erscheint es daß die Kapillaren in der Ruhe zu einem großen Teil nicht funktionieren leer sind und nur während der Arbeit sich alle füllen das Organ also dabei viel mehr und viel dichter durchblutet wird Krogh hat diese Tatsache mit Nachdruck hervorgehoben und sie ist deswegen von großer Bedeutung weil diese bessere Kapillarisierung gerade im arbeitenden Organ im Muskel selbst stattfindet

Es wird nun ein zwangsläufiges Verhältnis zwischen O_2 Ausnutzung und Minutenvolumen angenommen und zwar in der Hinsicht daß je mehr Sauerstoff vom Gewebe aufgenommen wird desto weniger Blut kreist umgekehrt glaubt man im allgemeinen aus einem erhöhten Minutenvolumen auf ungenügende Sauerstoffausnutzung schließen zu können

Die Bestimmung der Sauerstoffausnutzung hat sich also als eine außerordentlich wichtige Angelegenheit herausgestellt denn Werte von so fundamenteller Bedeutung wie Minuten und Schlagvolumen wurden dadurch in ihrer Abhängigkeit von dem Gewebestoffwechsel erkannt Auch in anderer Hinsicht ist sie von großem Werte insofern sie uns auch bei der Kreislaufinsuffizienz einen Einblick in die Stoffwechselstörungen in den Organen gestattet

O_2-Ausnutzung und Stoffwechselstörung bei Herzinsuffizienz Bei aus irgendeinem Grunde entstandener Kreislaufinsuffizienz ist die Ausnutzung des Blutsauerstoffes im Kapillargebiet mehr oder weniger herabgesetzt Die Ursache wird in einem mangelhaften Chemismus der Muskeltätigkeit also des bei der Arbeit am meisten O bedürftigen Gewebes gesucht

Nach der augenblicklich geltenden Auffassung wird bei der Muskelkontraktion Glykogen anoxybiotisch (also ohne O_2 Verbrauch) in Milchsäure umgesetzt Diese Milchsäure wird in der Folge nicht gänzlich neutralisiert verbrannt weggeschafft sondern vier Fünftel werden für den Wiederaufbau des Glykogens (Resynthese) nutzlich verwendet Nur ein Fünftel wird unter Aufnahme von Sauerstoff zu Kohlensäure und Wasser verbrannt Dieser außerordentlich ökonomische Vorgang erscheint bei Kreislaufinsuffizienz gestört insoweit der Wiederaufbau von Glykogen in viel geringerem Maße stattfindet Dadurch muß mehr Milchsäure verbrannt werden es besteht ein Mehrbedarf (Requirement) an O_2 welcher nun durch Zunahme der zugeführten arteriellen Blutmenge gedeckt werden muß Die erste Kreislauffolge ist also wie beim Arbeitsversuch diese daß in der Minute eine größere Menge Blut den Kreislaufapparat passiert das Minutenvolumen gesteigert wird soll aber das Herz mehr Blut verarbeiten so muß es auch mehr Blut aus der Peripherie zugeführt

bekommen Geschieht dies nicht so wird nicht genugend Milchsaure im Muskel verbrannt die Saure wird im Blut nachweisbar und eine Sauerung des Blutes entwickelt sich erhöht durch die bei dieser Störung ebenfalls mehr auftretende Kohlensaure Vielleicht ist die physiologische Ermudung eine Folge dieser nicht mehr genugenden Glykogenresynthese in den Muskeln

Die Azidose welche bei allerlei anderen Krankheiten Ursache oder Förderer zahlreicher Störungen ist spielt al o auch hier eine Rolle Sie hat einen ungunstigen Einfluß auf die Kreislaufinsuffizienz und steigert Odembildung und Atemnot Auch der CO Gehalt des Blutes ist infolge der unter diesen Umstanden erhöhten Milchsaureverbrennung gesteigert Diese CO Anhaufung kann nachgewiesenermaßen eine Herzerweiterung hervorrufen welche nach Eppinger besonders das rechte Herz betrifft Die Ursache dieser letzteren Besonderheit finden wir in der S 31 behandelten Regel daß bei allgemein gleichmaßiger Herzmuskelschadigung das rechte Herz am meisten leidet

Es drohen daher infolge der Stoffwechselstorung in den peripheren Geweben dem Herzpatienten von allen Seiten Gefahren Diese Tatsache stellt uns vor die Beantwortung zweier Fragen a) Wodurch wird diese periphere Störung hervorgerufen? und b) Ist nicht auch der Herzmuskel selbst das Opfer eines in solcher Weise gestörten Stoffwechsels?

a) Anfangs hatte es den Anschein als wolle man die periphere Stoffwechselstörung als denjenigen Faktor betrachten der erst sekundar Herzschwache und Dekompensation hervorruft Dem Arzte am Krankenbette kommt diese Auffassung beinahe als widersinnig vor wozu waren sozusagen die vielen Klappenfehler und sonstigen Herzkrankheiten da wenn nicht zum Verursachen einer Kreislaufinsuffizienz? Es entspricht mehr dem gesunden Verstand anzunehmen daß erst die nach und nach schwacher werdende Herztatigkeit einen verringerten peripheren Kreislauf hervorruft und dadurch Stoffwechselstörungen in der Peripherie speziell in der Skelettmuskulatur entstehen laßt Diese können dann ruckwirkend auch den Herzmuskel direkt oder indirekt schadigen Der Circulus vitiosus erschiene damit geschlossen und es ware Aufgabe der Therapie diesen zu durchbrechen und so die Besserung herbeizuführen

Gegen diese letztere Auffassung wurde angefuhrt daß schon im allerersten Anfang der Dekompensation das Minutenvolumen erhöht gefunden wurde was darauf hinzuweisen schien daß schon in diesem Stadium der Wiederaufbau des Glykogens in der Muskulatur gestört ist die dadurch uberschussig werdende Milchsaure verlangt dann zu ihrer Oxydation mehr O_2 welcher von Herz und Kreislauf durch größere Zufuhr herbeigeschafft werden muß Es wird aber in der letzten Zeit wie es scheint nicht mit Unrecht an der

Existenz dieser frühen Erhöhung des Minutenvolumens gezweifelt auch wird behauptet daß eine Herabsetzung dieses Wertes die mehr der Natur der Herzinsuffizienz entsprechen würde die Regel bildet Wahrscheinlich liegt die Wahrheit wohl in der Mitte (siehe auch S 92) und kommt beides vor Jedenfalls kann diese Frage einstweilen noch nicht als gelöst betrachtet werden

b) Wahrscheinlicher als die Annahme einer Priorität der peripheren Stoffwechselstörung wäre die Vorstellung daß Herzmuskel und Skelettmuskel gleichzeitig gemeinsam infolge irgendeiner den quergestreiften Muskel treffenden Noxe erkranken Wir haben unter Wasserwechsel (S 77) schon ein Paradigma einer solchen generellen Muskelschädigung im Beriberi Herzen feststellen können in einer diesbezüglichen Arbeit (*1*) wurden unsererseits auch analoge Vorgänge beim Myxödem beschrieben Eine solche gemeinsame Erkrankung in Fällen in welchen das Herz vorher keine Klappenfehler oder sonstige Schädigungen aufwies kommt vielleicht gar nicht so selten vor

Hier taucht dann die neue Frage auf ob bei gemeinsamer Krankheitsursache Herz und Skelettmuskel in gleicher Weise leiden oder in verschiedenem Ausmaße Eppinger äußerte sich gelegentlich (*9*) daß das Warmbluterherz resistenter gegen Stoffwechselstörungen sein muß als die Skelettmuskulatur weil es aus dem Organismus herausgenommen noch stundenlang spontan schlagen kann ohne daß es dabei zu hochgradiger Milchsäureansammlung kommt In seiner letzten Arbeit widmet er den mutmaßlichen Ursachen der reinen Herzinsuffizienz ein großes recht schwieriges Kapitel welchem die Tatsache entnommen werden kann daß das Herz zwar einerseits außerordentlich günstig kapillarisiert ist andererseits der Herztätigkeit mancher Noxe gegenüber sehr empfindlich ist (Infektionen!) auch solchen welche vom gestörten Stoffwechsel (Säuerung O_2 Armut) herrühren Vielleicht gibt hier ein von Goldenberg (*13*) zitierter Befund von Katz und Long mehr Licht sie fanden daß der Herzmuskel nicht imstande ist mit einem so großen Zukurz an Sauerstoff zu arbeiten wie der Skelettmuskel

Um diese Argumente zu verstehen ist es notwendig sie kurz zu besprechen was uns zu gleicher Zeit veranlassen kann die Aufmerksamkeit auch des Praktikers auf noch eine andere wichtige Erscheinung bei kräftiger Muskelarbeit zu lenken

Die O_2-Schuld Auch der vollkommen gesunde Herzmuskel soll plötzlich zu rascher schwerer Arbeit gezwungen nicht imstande sein den ganzen Mehrbedarf an Sauerstoff (requirement) zum Wiederaufbau der dabei gebildeten Milchsäure zu Glykogen sofort zu erlangen Wie wir sahen steht infolge des verspäteten Einsetzens der Depressorwirkung (siehe S 54) auch beim normalen Menschen nicht sofort

die benötigte Blutmenge zur Verfugung Trotzdem arbeitet der Muskel weiter unbekummert ob er dabei vielleicht Schulden machen muß (debt) er kann das tun weil er uber einen gewissen Vorrat Glykogen verfugt aus dem er seinen Bedarf vorlaufig deckt Nur muß nach Ablauf der Arbeit der Vorrat wieder angefullt und namentlich die vermehrte Milchsaure oxydiert werden Der gesunde Organismus ist imstande diese Puckzahlung der gemachten Schulden tatsachlich zu leisten Jeder Arzt der Patienten im vierten Stock zu besuchen hat weiß wie leicht und schnell er die Treppen steigen kann jedoch schon beim Patienten angelangt einige Minuten vor Kurzatmigkeit nur muhsam reden kann Offenbar wird in diesem Augenblicke der Ruckstand seines O_2 Verbrauches rucksichtslos eingefordert Wichtig ist nun daß der geschadigte Muskel infolge seines unökonomischen Chemismus eine viel größere Sauerstoffschuld bis zum Achtfachen nachzuholen hat und viel mehr Zeit fur diese Ruckzahlung braucht Verfugt das Herz nun wirklich uber einen viel geringeren O Kredit als der Skelettmuskel so muß es bei O_2 Mangel z B unter Verminderung der Blutzufuhr infolge experimentellen Koronarkrampfes raschestens versagen (Goldenberg und Rothberger)

Man muß also mit der Wahrscheinlichkeit rechnen daß der Herzmuskel noch mehr unter den genannten Stoffwechselstörungen leidet als der Skelettmuskel selbst Quantitativ mit Rucksicht auf den Milchsauregehalt des Gesamtblutes wird man der unendlich viel größeren Masse der Körpermuskulatur naturlich einen uberragenden Einfluß zuerkennen mussen

Die hier wenn auch nur auszugsweise und etwas primitiv dargestellten Stoffwechselstörungen mögen immerhin einen Eindruck von den neuesten Bestrebungen und Ansichten auf dem Gebiete der Herz und Kreislaufinsuffizienz geben Wenn sich diese Störungen auch schließlich in dynamischen und mechanischen Änderungen des Zustandes im Kreislaufapparat auswirken so bilden sie doch ein neues Gebiet auf welchem die Forschungen in vollem Gange sind und noch sehr Wichtiges zur Erklärung der Kreislaufinsuffizienz werden beitragen können

Die Blutmengen

Das Minutenvolumen und die Methode der Bestimmung wurden schon kurz besprochen Wir verstehen darunter jenes Quantum Blut welches in der Zeiteinheit vom rechten Herzen aus den großen Venen ausgeschöpft wird die Lungen durchlauft und von der linken Kammer in das zentrale Aortengebiet ausgestoßen wird Die Notwendigkeit diese Werte im normalen und pathologischen Zustand des Kreislaufs zu kennen ging schon hervor aus der Erfahrung daß jede Änderung im Organismus sich in veränderter Kreislaufgröße äußert Natürlich umfaßt die es Minutenvolumen welches uns ein Maß fur die durch

das Herz geleistete Arbeit verschafft nur einen Teil der Gesamtmenge des im Organismus befindlichen Blutes

Die Gesamtblutmenge ist eine Größe welche schon in den alten Zeiten die Ärzte lebhaft beschäftigte Über das Vorkommen einer **Plethora vera** einer wirklichen Vollblütigkeit ist sogar schwer gekämpft worden Sie gehörte zum sanguinischen und cholerischen (jetzt pyknischen) Typus und sollte zur Apoplexie prädisponieren die Blutarmut hingegen war ein Teil der lymphatischen Konstitution und gab Veranlassung zu den verschiedensten Formen des vieldeutigen Begriffes der Anämie Nur für den Zustand einer zu geringen Gesamtblutmenge ist **Oligämie** der passende Ausdruck man soll diese Ausdrücke Oligämie und Plethora nicht wie es jetzt auch von leitender Stelle geschieht auf die zirkulierende' Blutmenge anwenden will man es nicht dem Leser unmöglich machen die diesbezüglichen Arbeiten überhaupt zu lesen Es handelt sich wie gesagt um die **Gesamtmenge** des Blutes wobei natürlich über die Zusammenstellung des Blutes nichts ausgesagt und die sehr wechselnde Blutkörperchenkonzentration nicht berücksichtigt wird Für die Plethora Gattung mag wohl die Polycythaemia vera für die Oligämie der Zustand des akuten oder chronischen Blutverlustes als typisches Beispiel dienen

Bedauerlicherweise gelingt es bis jetzt nicht die Gesamtblutmenge beim lebenden Menschen zu bestimmen weil es Organe wie die Milz und andere namentlich auch große Kapillardistrikte gibt welche von experimentell ins Blut gespritzten Substanzen gar nicht erreicht werden Sogar an der Leiche ist es nicht leicht alles Blut zu bestimmen

Die vor kurzem von **Aschoff** (2) durchgeführte Untersuchungsreihe enthält merkwürdige stark auseinandergehende Werte bestimmt jedoch nur einen kleinen Bruchteil der Gesamtmenge Es wurde die Blutmenge gemessen welche durch Ausschöpfen aus den Herzhöhlen und aus dem Herzbeutel bei Nachdrücken an der Aorta thoracica erhalten wird Erfaßt wird dabei nur das Blut welches sich im Herzen selbst in den Lungen und den herznahen großen Venen und in der Leber befindet Gerade in diesen Teilen aber befinden sich die großen Stauweiher der Herzinsuffizienz Es **müssen** dabei sehr große Blutwerte angetroffen werden was aber über die übrigen im Organismus vorhandenen Blutmengen nichts aussagt. Auch der in der Diskussion von **Dietrich** hervorgehobene Einwand daß das häufig so überfüllte Gebiet der splanchnischen Venen nicht in Rechnung kommt spricht dafür daß zwar die Zahlen einen gewissen Wert besitzen jedoch für **unsere** Fragestellungen noch nicht maßgebend sein können

Die Gesamtblutmenge ist in vieler Hinsicht eine für die Klinik sehr wichtige Angelegenheit Sowohl ein Zuviel als ein Zuwenig kann schaden beide haben auch ihre guten Seiten Plethora steigert die Aufgaben des Herzens welches stark belastet und erweitert wird und dabei hypertrophiert die Gefäße werden mehr in Anspruch genommen beide kommen in Gefahr der Abnutzung ceteris

paribus mußte man eine herabgesetzte Stromungsgeschwindigkeit erwarten Dafur bringt die große Zahl von Sauerstofftragern mehr O die Peripherie wo auch die Stromung durch die größere Zahl von Blutkörperchen verlangsamt wird was der Ausnutzung des Sauerstoffs zugute kommt Andererseits soll in stark gefullten Kapillaren weniger O_2 abgegeben werden Die Oligamie hingegen verlangt weniger Arbeit von Herz und Gefaßen dafur bringt sie weniger O_2 die Peripherie die Strömungsgeschwindigkeit kann eine große die Ausnutzung eine geringe sein Hier mußte nun (S 80) ein größeres Minutenvolumen einsetzen also doch wieder Mehrarbeit des Herzens Es hangt daher alles von den Verhaltnissen im Einzelfalle ab ob mehr Schaden als Nutzen resultiert Beide Zustande verlangen aber haufig und dringlichst Remedur welche im einen Falle (Plethora) von dem mit Recht wieder zu hohen Ehren gekommenen Aderlaß im anderen Falle von der lebensrettenden Bluttransfusion und den Kochsalzinfusionen herbeigefuhrt werden kann Das gilt auch fur den unblutigen Aderlaß das Halbabbinden von Extremitaten mit noch offenen Arterien und gesperrten Venen bei Plethora das durch Esmarchsche Binden in den Kreislauf Verdrangen von Extremitatenblut hingegen ist bei Oligamie in kritischen Augenblicken von großem Wert Eventuell soll man die Umschnurung des Bauches nicht ubersehen um im Bauche stagnierendes Blut dem großen Kreislauf dem Herzen und dem Gehirn zuzufuhren

Wahrend man bei Herzinsuffizienz wohl kaum in die Lage kommt eine Zunahme der gesamten Blutmenge dankbar zu begrußen kann zuweilen eine bedeutende Abnahme sehr willkommen sein Namentlich gilt das fur die spontan einsetzende langsame Abnahme der gesamten Blutmenge in Fallen von schwerer und irreduktibler *Herzinsuffizienz mit bedeutender Leberschwellung und Ödemen* F möge hier ein diesbezuglicher Fall kurz geschildert werden

Fall 11 Ein kleines Madchen mit schwerem kompliziertem Klappenfehler Vorhofflimmern Leberstauung positivem Venenpuls und Ödemen besucht seit ihrem 15 Lebensjahre die I Medizinische Klinik Anfangs wirkte eine Digitalis-Chininbehandlung zu Hause fortgesetzt ausgezeichnet Nach längerer Zeit kommt sie in dem beim ersten Besuche festgestellten Zustand wieder herein auch diesmal hat die Behandlung den vollen Erfolg Von da an wiederholt sich dieser Vorgang jedoch mit immer kürzeren Intervallen und immer weniger befriedigendem therapeutischen Resultat Endlich ist der Augenblick gekommen in welchem trotz langen Aufenthaltes in der Klinik der Zustand nicht mehr besserungsfähig erscheint Sie verläßt uns in einem Zustande welcher erwarten läßt, daß wir sie nicht wiedersehen werden **5 Jahre später** war sie zum ersten Male wieder da, bedeutend gebessert in erträglichem Zustand doch waren zuletzt die Ödeme wieder aufgetreten Sie war uns nicht untreu geworden andere Behandlungsmethoden die vermocht hätten was wir nicht erreichen konnten waren nicht angewendet worden sondern bei der alten Therapie war ganz allmählich ein besseres Befinden eingetreten Jetzt erst führte das Wiederauftreten von Ödemen sie zu uns Der Zustand schien objektiv kaum verändert z

sein noch immer pochte das stark vergrößerte Herz an die Brustwand und setzte Interkostalraum und Rippen in Bewegung Die linke untere Thoraxhälfte war infolge der Vergrößerung der linken Kammer mächtig ausgebuchtet der Leberpuls war hart und sichtbar und wölbte die Leber im Augenblicke in welchem links der linke Ventrikel die Rippen hob nach rechts vor die untere Thoraxapertur war durch diese Bewegung stark auseinandergedrängt und vergrößert Von der vorhandenen Kraft des hypertrophischen Herzmuskels konnte man sich beim ersten Blick überzeugen Eine Behandlung mit Digitalis und Diuretika besserte sofort den Zustand

Epikrise Die einzige eingetretene Veränderung welche für die relativ sehr bedeutende subjektive Besserung des Zustandes verantwortlich gemacht werden konnte war eine starke Abmagerung und Wasserverarmung Zwar war die Leber noch das große Blutreservoir welches den übrigen Kreislauf vor Überschwemmung schützte die ganze Peripherie schien jedoch außerordentlich blutleer zu sein Zweifellos hatte bei dem Eingehen der Gewebe auch das Blut an Menge stark eingebüßt was dem Herzen und dem Kreislauf zugute kam Das eigentümliche Gleichgewicht oder wenn man will der Ausgleich welcher bei komplizierten Klappenfehlern sich einstellen kann (siehe S 21) war hier aller Wahrscheinlichkeit nach durch die Abnahme von Körpergewicht und Blutmenge möglich geworden

Solche Fälle mögen selten gesehen werden und in der Literatur nicht oder kaum zu finden sein sie sind nichtsdestoweniger von großer Bedeutung für das Verständnis der Kompensation und wenn man sie einmal kennt begegnet man ihnen nicht so selten Am häufigsten findet man solche relative Besserung bei alten Leuten die schon durch ihr Alter zur Abnahme und Kachexie neigen Weibliche Patienten die nach qualvollem Klimakterium einen Teil ihrer Kompensation zurückbekommen wenn sie nur abmagern und austrocknen können noch eine Anzahl Jahre eine ruhigere Zeit in erträglichem Zustande erleben Der therapeutische Erfolg starker Einschränkung von Nahrung und Wasser mag wohl zu einem Großteil der dadurch erzielten Herabsetzung der Gesamtblutmenge zuzuschreiben sein Es wäre erwünscht in solchen Fällen nicht nur die zirkulierende Blutmenge sondern auch die Gesamtblutmenge messen zu können Nach einer mündlichen Mitteilung F Kovács sind auch ihm solche auffallende Besserungen beim Einsetzen einer Art Kachexie bekannt Ich habe diesem erfahrenen Kliniker für folgende Äußerung sehr zu danken

„Meistens handelte es sich um sehr alte lange getragene schwere Mitralfehler bei welchen es zu einer allgemeinen Organatrophie (Herzfleischkachexie) gekommen war und damit zu einer ganz auffallenden Besserung der Kreislaufverhältnisse insbesondere Rückgang des Haut und Höhlenhydrops und beträchtliche Verkleinerung der Stauungsleber Zugleich mit diesen objektiven Veränderungen tritt eine wesentliche Besserung des subjektiven Befindens und eine Zunahme der körperlichen Leistungsfähigkeit ein Die Erklärung der angeführten Veränderungen möchte ich im wesentlichen in einer mit der Kachexie einhergehenden Abnahme der Blut-

und Körpermaße sehen Interkurrente Verschlechterungen die kardiotonische Behandlung neuerdings notwendig machen kommen immer ab und zu vor

Die Plethora bei der starken Zyanose gewisser angeborener Herzfehler mag wohl auf irgendeinem reflektorischen oder hormonalen Regulierungsvorgang beruhen was allerdings an sich noch nicht viel aussagt Es wird wohl die Sauerstoffnot der Gewebe sein welche kompensierende Maßnahmen herauslockt Neben der schon besprochenen Vermehrung der zirkulierenden Blutmenge und der verlangsamten Blutgeschwindigkeit im Kapillargebiet kommt natürlich eine bedeutende Vermehrung der O Träger der roten Blutkörperchen als praktische Aushilfe in Betracht Man kann ähnliche Vorgänge auch bei den verschiedenen Formen der Kreislaufinsuffizienz (Mitralstenose[1]) erwarten Die Milz welcher als Erythrozyten Speicher und Spender bekanntlich eine große Bedeutung zugeschrieben wird kann wohl kaum die einzige Quelle der Hyperglobulie sein denn es handelt sich um bleibende Zustände man wird um die Annahme einer gesteigerten Hämopoese wohl nicht herumkommen Rößle erwähnt in der Diskussion nach Aschoff (l c) die Anwesenheit größerer Mengen roten Marks in den Röhrenknochen von übermäßigen Biertrinkern[1]

Die zirkulierende Blutmenge Denjenigen Teil des Gesamtblutes der tatsächlich kreist sich auf der Hauptverkehrsstraße befindet nicht wie dies besonders in der Ruhe der Fall ist sich in Sackgäßchen und engeren Straßen oder auf abseits gelegenen weiteren Plätzen aufhält nennt man die zirkulierende Blutmenge Es besteht natürlich keine scharfe Trennung zwischen beiden Gebieten auch in den Nebengassen ist ein Verkehr und ein Austausch von Verkehrsmaterial zwischen beiden Seiten mag wohl fortwährend stattfinden Wir sollen daher den erhaltenen Werten der zirkulierenden Blutmenge keine allzu große Exaktheit zusprechen

Man bestimmt annähernd die zirkulierende Blutmenge mit Hilfe verschiedener Methoden die zwei gebräuchlichsten d Kohlenmonoxyd und die Farbstoffmethode konkurrieren Bei der ersten wird ein bekanntes Quantum CO von der Versuchsperson eingeatmet und dessen Verdünnung im Blute durch Bestimmung der CO Konzentration im strömenden Blute im Laufe einiger Minuten festgestellt Aus dem Grade der Konzentration kann man auf die Blutmenge schließen welche diese Verdünnung zustande gebracht hat Die zweite ist die Einspritzung blutfremder Substanzen in die Vene einer Extremität Bedingung ist daß diese Stoffe (Kongorot z B) nicht allzu rasch vom Speicherorgan (retikulo-endothelialem System) und vom Gewebe aufgenommen und demzufolge in kurzer Zeit aus dem Blut verschwinden würden Es wird der Zeitpunkt der Injektion notiert und dann zur Blutentnahme eine Vene an einer anderen Körperstelle (Arm) punktiert In Intervallen von wenigen Sekunden wird nun das Venenblut auf seinen Gehalt an eingespritzter Substanz untersucht. Drei Hauptpunkte werden dann notiert a) der Augenblick des ersten Auftretens dieser Substanz, b) der Augenblick der höchsten Konzentration derselben c) der Augenblick in welchem das Niveau dieser Konzentration sich für kurze Zeit auf einer gleich

bleibenden Höhe einstellt Mit a) dem ersten Erscheinen wird die Zeit gemessen welche das mit der Substanz beladene Blut gebraucht hat den Weg durch zuführende Vene rechtes Herz Lunge linkes Herz Arterie und die zur zweiten Punktionsstelle führende Vene zurückzulegen Sie gibt uns ein recht verläßliches Maß für die Strömungsgeschwindigkeit im durchströmten Gebiet dessen Länge man ziemlich genau abschätzen kann b) zeigt die Geschwindigkeit des axialen Blutstromes in den Gefäßen welche das beladene Blut am schnellsten und noch am wenigsten durchmischt zur zweiten Punktionsstelle geführt hat c) ist der Augenblick in welchem die Durchmischung allen für die eingespritzte Substanz erreichbaren Blutes stattgefunden hat Die dabei gefundene Konzentration verglichen mit der Konzentration der eingespritzten Flüssigkeit ermöglicht es zu berechnen in wieviel Blut die Durchmischung stattgefunden hat (Siehe u A Heilmeyer und Riemschneider *16*)

Die Bestimmung von a) und c) besitzt für die Kreislaufforschung einen besonderen Wert Für die Ernährung der Gewebe wie für die O_2 Beschickung ist ein rascher Transport sehr erwünscht und die zirkulierende Blutmenge stellt in Relation zum Minutenvolumen ein Maß der vom Herzen zu bewältigenden Arbeit dar Namentlich letztere Größe ist in früheren Jahren nicht in Rechnung gezogen worden weil wir sie nicht gekannt haben Daß nicht nur bei körperlicher Arbeit sondern auch bei Herzinsuffizienz die zirkulierende Blutmenge vergrößert sein kann ist eine Möglichkeit mit welcher bei der Beurteilung der Herz und Kreislaufinsuffizienz erst seit kurzem gerechnet wird So beschäftigt sich die moderne Kreislaufforschung lebhaft mit ihrer Größe es ist nur zu bedauern daß einstweilen eine Gleichheit der Befunde noch nicht erreicht wurde wodurch die Verwendung der gefundenen Zahlen für das Verständnis pathologischer Zustände noch sehr erschwert ist

Die verschiedenen Größen des Blutkreislaufs werden in den folgenden Abschnitten uns noch so häufig beschäftigen daß wir sie hier noch kurz rekapitulieren wollen

Die Bezeichnung Gesamtblutmenge umfaßt das ganze im Körper vorhandene Blut

Die zirkulierende Blutmenge ist derjenige Teil des Gesamtblutes welcher tatsächlich zirkuliert sich also auf den Hauptverkehrsstraßen des Kreislaufapparates befindet auf welchen das Blut in lebhafterer oder ruhigerer Bewegung fließt

Mit dem Ausdruck Depotblut wird jener andere Teil des Gesamtblutes gemeint der abseits der Hauptbahn sich in Nebengassen verliert und am großen Kreislauf sich kaum oder jedenfalls nicht faßbar beteiligt

Das Minutenvolumen ist die Blutmenge welche in der Minute vom Herzen verarbeitet wird während eine gleiche Menge Blut auch dem Herzen zugeführt wurde Eine recht klare Bezeichnung ist auch die Menge Blut welche in der Minute die Lungen passiert

Das Schlagvolumen endlich ist die Quantität Blut welche bei der Einzelsystole in die Aorta hineinbefördert wird

Die Regulierung des Kreislaufs in guten und in bösen Zeiten

Der Regulierung des Kreislaufs unter physiologischen Bedingungen steht eine geradezu ungeheuerlich vielseitige Organisation zur Verfügung. Zur Aufrechterhaltung eines sowohl die allgemeinen Bedürfnisse als die Einzelwünsche befriedigenden Kreislaufs ist ein ganzes Heer von Dienern verschiedener Art, Wesen und Herkunft notwendig. Es ist schwer, diese zahlreiche Dienerschaft übersichtlich zu ordnen, jedoch gelingt es vielleicht, einige Hauptgruppen zu formulieren[1].

Der Kreislaufapparat selbst verfügt über automatische Regulierungen, zu dieser Gruppe gehören die anfangs beschriebenen dynamischen Gesetze des Herzmuskels (S. 4): Anpassung an veränderte Füllung infolge geänderter Zufuhr oder geänderter Entleerung und Widerstand. Es scheint wohl festzustehen, daß auch gewisse Gefäßregionen eine solche wohl der glatten Muskulatur anhaftende Eigenregulierung besitzen.

Vom Kreislaufapparat selbst gehen reflexerregende Impulse aus, welche entsprechend regulierend ins Getriebe des Apparates selbst eingreifen; als Beispiel mögen die depressorischen Reflexe, welche von der Aortenwurzel und von dem Sinus caroticus ausgehen, genannt werden. Letztere wurden von H. F. Hering (*17*) entdeckt und von ihm und anderen in ihrer Bedeutung weiter studiert. Die Resultate sprechen von einer unglaublichen Mannigfaltigkeit der regulierenden und modifizierenden Einflüsse, die er „Blutdruckzügler" auf den ganzen Kreislaufapparat. Außerdem spielen sie bei den Karotis-Sinus, auch bei einem großen Teil derjenigen Reaktionen, die man bis jetzt dem Atemzentrum zugeschrieben hat, eine vorherrschende Rolle (C. Heymans *19*). Das könnte uns zur Ansicht verführen, daß die Selbststeuerung des Kreislaufapparates vielleicht der allerwichtigste aller Regulationsmechanismen für den Kreislauf ist. Vom genetischen Standpunkt betrachtet, wurde eine solche Feststellung durchaus plausibel erscheinen.

Zweifellos bestehen auch reflektorische pressorische Wirkungen, solche sollen ebenfalls von der Aorta ausgelöst werden können, und es wurde schon der arterielle Hochdruck bei Aortenleiden daraus zu erklären versucht (Wassermann *30*). Von der Venenseite geht der viel zitierte Reflex von Bainbridge aus: Überfüllung der zentralen Vena cava und des rechten Vorhofs verursacht Erhöhung der Herzfrequenz mit Kürzung der Systolendauer, beide geeignet, durch raschere und häufigere Austreibung die größere Blutzufuhr zu ver-

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[1] Eine sehr gut systematisch und kritisch geordnete Übersicht über diesen Gegenstand findet sich in der hier schon zitierten Arbeit von W. C. Heß (*18*).

arbeiten Man kommt in Versuchung eine uberaus große Zahl solcher Reflexmechanismen im Körper anzunehmen, und zwar vor allem zwecks richtiger Blutzuteilung an die so verschieden blutbedurftigen Organe Allerdings sind solche örtliche Depressoren Blutdruckzügler und Konstriktoren im ubrigen Gefaßapparat noch nicht sicher nachgewiesen worden

Ausgiebige chemische und physikochemische Beziehungen vermitteln den Verkehr zwischen Zirkulation und entfernteren Regulierungszentren Sauerung des Blutes O_2 Gehalt CO Spannung Konzentration Zuckergehalt usw uben ihren Einfluß aus vor allem auf die in dieser Beziehung außerst empfindlichen Gehirn und medullaren Zentren Neben den haupt und untergeordneten vasomotorischen Zentren ist hier besonders des Atemzentrums zu gedenken welches eine außerordentlich wirksame Regulierungsstation darstellt Bekanntlich und nach unseren Begriffen auch naturlich ist es vor allem der O_2 und CO Gehalt des Blutes der via Atemzentrum die O_2 Aufnahme und CO_2 Abgabe reguliert Immer mehr wird diese Rolle des Atemzentrums als Ursache der Dyspnoe der Herzkranken erkannt (siehe unten)

Neben dieser physikochemischen Vermittlung besteht auch eine hormonale Gefaßerweiternde (Histamin) und gefaßverengernde Stoffe (Adrenalin) werden von den innersekretorischen Drusen auch von einem scheinbar so indifferenten Gewebe wie dem sogenannten Bindegewebe auf den Kreislaufapparat losgelassen namentlich dort wo es gilt entfernte und allgemeine Wirkungen auszulösen Taglich steigt die Zahl solcher uns bekannt werdender Produkte des Körpers selbst Diese Mittel wirken durchaus nicht immer ausschließlich gunstig sie können unter Umstanden auch stören

Auch die höchsten Zentren vermögen einzugreifen Zwar können wir selbst gottlob Herz und Kreislauf nicht wie z B die Atmung direkt beeinflussen dafur tun unsere Affekte dies um so mehr Vor Schrecken steht uns das Herz still Erwartung beschleunigt Furcht hemmt wir erröten und erblassen unter kontraren haufig auch ganz absonderlichen Bedingungen Die Stimmungslage beherrscht den Tonus unserer Gefaße und des Herzens Es röten sich die Wangen der gelangweilten blassen Schulkinder wenn ein geliebter Lehrer das Schulzimmer betritt (A Czerny) Rege geistige Tatigkeit strafft und beschleunigt den Puls der Zerfahrene zeigt gesteigerte Sinus arrhythmie Angst wirft die ganze Regulierung uber den Haufen Auch das umgekehrte Verhaltnis besteht alles was sich in dem Herzen und um dasselbe an Sensationen bemerkbar macht wirkt unmittelbar deprimierend und kann Todesangst hervorrufen auch da wo dem Herzen nichts fehlt Das ist nun nicht alles Regulierung im Gegenteil, haufig stellt diese zentrale Teilnahme am zirkulatorischen Geschehen einen Schaden dar Notwendig fur den Arzt aber ist das

Wissen um diese Zusammenhänge, wie soll er sonst das wunderliche Geschlecht der sogenannten **Herzneurotiker** verstehen lernen?

Welche Hebel werden nun von diesen zahllosen Regulierungsvorgangen angesetzt, um zweckmäßig auf den Kreislaufbetrieb einzuwirken? Diese Frage ist im allgemeinen dahin zu beantworten, daß, so weit es das Gefäßsystem gilt, Verengerung und Erweiterung der Blutbahn die Mittel sind, um die notwendigen Blutverschiebungen, den Druck und die erwünschte Kreislaufgeschwindigkeit zu bewerkstelligen. Auch am Herzen machen höchstwahrscheinlich reflektorische Tonusänderungen es möglich, erwünschte Erweiterung oder das Gegenteil, Verkleinerung des Herzlumens durchzuführen. Außerdem aber versteht es das regulierende Nervensystem Frequenz, Herzkraft, Reizleitung, Schlagzeit je nach der gegebenen Lage zu modifizieren.

Endlich müssen wir bei der Analyse der Kreislaufregulierung mit einem Umstand rechnen, dem wir schon am Urbild der Kreislaufstörung (Abb. 2, S. 2) begegnet sind und den wir damals als das Thema betrachtet haben, welches wir in allen Variationen in Dur und in Moll wiedererkennen sollten. Es ist die dem geschlossenen Kreislauf anhaftende Eigenschaft, daß jede Änderung in einer Richtung an anderer Stelle eine entsprechende Änderung in entgegengesetzter Richtung erzwingt. Was stromaufwärts Überfüllung verursacht, setzt stromabwärts die Füllung herab. Auch im normalen Zustand begegnet man solchen sekundären Rückwirkungen. Wird z. B. von zwei Seiten die Anforderung an den Kreislauf gestellt, mehr Blut zur Verfügung zu stellen, so leiden beide Seiten unter der Konkurrenz oder die eine bekommt ihren Teil auf Kosten der anderen. Plenus venter non studet libenter. Wenn Magen und Gehirn gleichzeitig funktionieren, unterliegt unser so nebensächliches Denken der für das bloße Leben viel wichtigeren Magenverdauung. Überraschenderweise findet diese aus der täglichen Beobachtung des Krankhaften geborene Auffassung auch von physiologischer Seite ihre Bestätigung. In der schon wiederholt erwähnten Arbeit W. R. Heß (l. c. S. 103) lautet die Überschrift eines kleinen Kapitels: Hämodynamische Wechselwirkung als Störungsfaktoren. Die angeführten Beispiele entsprechen vollständig der hier geäußerten Anschauung. Umgekehrt würde es leicht sein, aus dem ersten Teil unserer Besprechungen einen langen Aufsatz über Störungen als günstige Regulierungsfunktion abzusondern. Eigentlich bringt es der geschlossene Kreis, in welchem sich die Vorgänge abspielen, eo ipso mit sich, daß Regulierung und Störung zusammen auftreten **müssen**, zusammen einen Vorgang darstellen wie **Ebbe und Flut!**

Der hier erörterte Gesichtspunkt macht es uns leicht, den Weg vom Physiologischen ins Pathologische, vom Guten zum Bösen zu finden. Es braucht dazu keine besondere Brücke geschlagen zu

werden beide Gebiete gehen fließend ineinander über Wollen wir das Pathologische verstehen, sollen wir auf das physiologische Geschehen achtgeben denn ein gut Teil des Pathologischen entsteht infolge physiologischer Regulierungsbestrebungen die in den veränderten Umständen nicht mehr richtig angebracht erscheinen

Unter allen hier besprochenen Vorgängen bei Kreislaufinsuffizienz ist keine mehr geeignet von dieser Vorstellung aus leicht erklärt zu werden als die Vergrößerung des Minutenvolumens und der zirkulierenden Blutmenge Gerade dieser Befund hatte anfangs etwas so Widersinniges an sich daß man sich nur schwer entschließen konnte sich den Tatsachen zu beugen

Wenn wie bei körperlicher Arbeit und erhöhter Tätigkeit wichtiger Organe (Verdauung!) der Mehrbedarf der Gewebe an Sauerstoff sich fühlbar macht wird neben anderen Maßnahmen durch Einengung der Sickergebiete des Kreislaufs Blut in die großen Verkehrsstraßen des Kreislaufs getrieben und dem Herzen zur raschen Weiterbeförderung zugeführt Dieser erzwungene Vorgang findet auch dort statt wo aus anderen Gründen mehr O verlangt wird Auch dann wenn eine ungenügende Herztätigkeit den Geweben zu wenig Blut verschafft erschallt der Gehorsam heischende Ruf nach Sauerstoff und die Blutmobilisierung wird eingeleitet

Diese vermehrte Blutmenge wird nun dem Herzen zugetrieben und in diesem Augenblicke offenbart sich die Knechtschaft in welcher dieses Organ steht vor aller Augen Trotz seines krankhaften Zustandes wird das Herz gezwungen sich bis zum äußersten anzustrengen größere Füllungen unter höherem Füllungsdruck in sich aufzunehmen und bei größerem Energieaufwand und in höherer Frequenz weiter zu befördern!

Hier wäre für den Romantiker unter uns der Augenblick gekommen sich am Wegrand niederzulassen und über die Vergänglichkeit alles Großen nachzudenken Harvey verglich das Herz mit der hervorragenden Figur seines Königs (Charles I) dem er ein treuer Diener war und sein unsterbliches Werk de motu cordis et sanguinis widmete In seiner Widmung stellte er beide auf eine Höhe mit der Sonne dem Zentrum der Welt um das sich alles dreht Sie fängt wie folgt an Cor animalium fundamentum est vitae princeps omnium Microcosmi Sol a quo omnis vegetatio dependet vigor omnis et robur emanat Rex pariter regnorum suorum fundamentum Rei publicae Cor est etc Die „Automatie des Herzmuskels ging aus dem langen Kampfe „neurogen gegen myogen in vollem Glanze als Sieger hervor Die dynamischen Gesetze der Herztätigkeit zeigten die überragend autonome Anpassung des Herzens an jede Größe der ihm gestellten Anforderungen Nichtsdestoweniger fiel hier das Wort der „Knechtschaft des Herzens" Rudolf Kaufmann unser zu früh verstorbener Wiener Kollege sagte in seinem letzten Vortrag in der Gesellschaft der Ärzte mit dem ganzen Nachdruck seines ernsten Wesens Das Herz ist ein Diener der animalischen es ist der Sklave der vegetativen Funktionen des Organismus"

Was hatte Harvey gesagt wenn er diesen Ausspruch erlebt hatte? Als alter weiser Mann hatte er sich getröstet er hat es ja auch erlebt daß der Kopf seines Konigs auf dem Schafott fiel! Fur uns ist es ein Fortschritt eingesehen zu haben daß auch das Herz dem Wohl der Gemeinschaft zu dienen hat sie nicht b herrscht

Verfolgen wir das Schicksal des Herzens in dieser kritischen Periode so können wir verstehen daß anfanglich das Herz noch imstande sein kann wenn auch notgedrungen einen Teil des mehr zugefuhrten Blutes in die Arterien auszuwerfen Demzufolge ist in diesem Augenblicke ein vergrößertes Minutenvolumen nicht ein Ding der Unmöglichkeit Das kann sich nun verschieden auswirken es kann größer sein als zu Beginn der Dekompensation als die Regulierungsaktion noch nicht eingesetzt hatte zweitens kann es dabei einen dem Gewicht des Patienten entsprechenden Normalwert erreichen das macht dann den Eindruck daß das Herz trotz Erkrankung ruhig sein Normalminutenvolumen weiter produziert Drittens kann das Minutenvolumen unter Umstanden den Normalwert uberschreiten Beide letztere Möglichkeiten erschienen vollkommen unverstandlich bis wir lernten daß sie nur durch außerste Anstrengung und auf Kosten des Herzens verwirklicht werden

Wichtiger und mehr demonstrativ als der Wert des Minutenvolumens allein ist das Verhaltnis desselben zur Größe der zirkulierenden Blutmenge Es hat sich experimentell herau gestellt daß beim kreislaufgesunden Menschen diese Menge ungefahr gleich groß ist wie das Minutenvolumen Dieses Verhaltnis 1 1 wird nun beim Kreislaufkranken in der Richtung gestört daß wie gesagt die kreisende Blutmenge stark zunimmt Es zirkuliert daher in der Minute nur ein Teil des in der Kreislaufbahn angehauften Blutes Je höher die O_2 Not steigt um so mehr werden die letzten Blutreserven an die Front geschickt Dann ist der Augenblick da in welchem ohne Hilfe von außen Herz und Kreislauf dem Erstickungstod geweiht erscheinen

Betrachten wir noch einen Augenblick den Gesamtzustand im Kreislaufapparat so finden wir den ganzen venösen Abschnitt besonders das Kavagebiet je nach dem am meisten an dem Zusammenbruch beteiligten Herzabschnitt auch Herz und Lungenkreislauf mit Blut überfullt Das Minutenvolumen ist langst auf niedrige Werte abgesunken das arterielle System ist schlecht gefullt alles vorhandene Blut wird mit letzter Anstrengung in die Richtung des Herzens geschickt Man findet daher ein kleines Minutenvolumen eine große zirkulierende Blutmenge mit anderen Worten der ganze Kreislauf ist überfullt nur ein relativ kleiner Teil des Blutes wird vom Herzen in Bewegung versetzt ein begreiflicherweise außerordentlich ungünstiger Zustand

Wir sehen daß die für die Arbeit des Gesunden unentbehrliche Vergrößerung der dem Herzen zugefuhrten Blutmenge bei Herzschwache einen schwersten Schaden fur Herz und Kreislauf bedeuten

muß Hiermit wäre wohl das wichtigste Novum aus den neuesten Kreislaufstudien ins Licht gestellt, und wir hätten daher das im ersten Teil dieser Arbeit unter dem Vorbehalt des „ceteris paribus" aufgestellte System der Kreislaufstörung in diesem Punkte zu revidieren!

Es wäre verlockend, jetzt an Hand unserer Darstellung im ersten Teil die Kreislaufvorgänge bei jeder eingetretenen Form der Kreislaufinsuffizienz zu analysieren. Ein bescheidener Versuch in dieser Richtung führt jedoch zur Einsicht, daß dazu die Zeit noch nicht gekommen sei. Noch allzusehr sind die Befunde und die Ansichten verschieden und widersprechend. Das liegt nicht nur an den angewendeten Untersuchungsmethoden; es klärt sich ja schon der Himmel über dem experimentellen Lager, und zweifellos wird man in dieser Beziehung in absehbarer Zeit zur Einigkeit der Meinungen gelangen. Ein viel größerer Fehler der für die klinischen Verhältnisse gezogenen Schlußfolgerungen ist die im allgemeinen ungenügende Analyse des Einzelfalles. Es wird über kompensiert und dekompensiert von Dyspnoe und Ödemen als Beweis für letzteren Zustand gesprochen, ohne daß auch nur versucht wird, ein klares Bild des Kreislaufzustandes der untersuchten Fälle aufzustellen. Sind wir bereit, unsere Auffassungen den neugefundenen Tatsachen anzupassen, so soll das hier erörterte System der Kreislaufstörungen oder ein besseres als Leitfaden zur Charakterisierung jedes einzelnen untersuchten Falles herangezogen werden. Sonst wird ein unvereinbares Nebeneinander von Meinungen bestehen bleiben. Die neuen Untersuchungsmethoden beanspruchen eine solche Energie und so viel Zeit, Mühe und Präzision der Beobachtung, daß das hier im Interesse der medizinischen Praxis Verlangte nur eine relativ winzige Steigerung des Arbeitspensums erfordern würde.

Der Kurzschluß im Kreislauf

Wenn zwischen arteriellen und venösen Bahnen aus irgendeinem Grunde eine direkte Verbindung zustande kommt, führen hämodynamische Kräfte zu merkwürdigen Änderungen des Kreislaufs. Mit Hilfe der modernen Methoden hat man diese gesetzmäßigen Folgezustände auf Blutdruck, Venendruck, Minutenvolumen usw. untersucht. A priori sind folgende Änderungen zu erwarten, was nicht bedeutet, daß sie in allen Fällen angetroffen werden müssen.

Da der Druck im arteriellen System höher ist als im venösen, fließt Blut aus ersterem in das letztere hinein. Es wird dadurch einem Teil des arteriellen Blutes, welches den Weg durch Arteriolen, Kapillaren und Venen zu nehmen hat, dieser Umweg erspart. Die Folgen sind: a) Der periphere Kreislauf wird weniger gefüllt, weil ihm ein

Teil des Blutes entgeht b) Der Blutdruck sinkt ceteris paribus weil durch diese Entleerung im arteriellen System die Gefaßwand weniger gespannt wird und ein Teil des Blutes in ein Gefaß mit geringerem Widerstand uberfließt (siehe Schema Abb 5 S 44) c) Durch das Eintreten von Blut unter arteriellem Druck wird der Druck in den Venen erhöht d) Der Venenabschnitt Fistel—rechtes Herz wird starker gefullt e) Das rechte Herz bekommt in der Zeiteinheit mehr Blut *weil der Weg von links nach rechts von den Arterien zu den* Venen von einem der Fistelöffnung entsprechenden Blutquantum in kurzerer Zeit zuruckgelegt wird Das rechte Herz verarbeitet daher ein größeres Blutquantum g) So viel Blut aus dem arteriellen Kreislauf entweicht passiert den Lungenkreislauf als Mehrgabe h) Das linke Herz verarbeitet dieses Mehr und erhöht dadurch das Minutenvolumen i) Die Herzfrequenz wird wie bei jeder physiologischen Mehrarbeit beschleunigt k) Die Vergrößerung des Minutenvolumens wirkt in der Richtung einer Kompensation der geringeren Fullung des peripheren arteriellen Systems und der Blutdrucksenkung welche zu erwarten waren

Besteht die Gelegenheit eine solche Kommunikation welche zur Bildung eines arterio venösen Aneurysmas fuhren kann manuell zu schließen oder einen Vergleich des Kreislaufzustandes von vor und nach einer operativen Schließung der Fistel anzustellen so kann man dadurch die Abhangigkeit der vorhandenen Kreislaufanderungen von dem Kurzschluß *mit* Sicherheit konstatieren

Wenn dieser Zustand langere Zeit bestehen bleibt zeigen sowohl die uberfullten wie die zu wenig gefullten Teile des Kreislaufapparates bleibende entsprechende Erweiterung oder Verengerung Namentlich ist das auch mit dem Herzen der Fall Ellis und Weiß fanden auch in solchen Fallen eine lokale oder auch generalisierte Erweiterung der Arteriolen und erklaren daraus die große Pulsamplitude Angeborene arterio venöse Kommunikationen tragen furs Leben die bleibenden Merkmale dieses abnormalen Kreislaufs Post mortem findet man die starker durchströmten Teile bedeutend erweitert mit verstarkter Muskelschicht in starkem Gegensatz zu den klein gebliebenen wenig *durchströmten Abschnitten Namentlich wirken sich* bei angeborenen Herzfehlern die veranderten Strömungsverhältnisse sehr merkwurdig und demonstrativ aus Beim Defekt der Kammerscheidewand bildet haufig die rechte Öffnung des Defektes einen nach links gerichteten Trichter die Ausflußöffnung links dagegen hat scharfe vorspringende die Stromrichtung andeutende Rander In einem *solchen Fall darf man daraus folgern daß venöses Blut aus* der rechten Kammer in die linke gepreßt worden ist das Blut wurde noch vor dem Pulmonalostium auf kurzem Wege nach links getrieben Die Arteria pulmonalis und der Lungenkreislauf blieben unterentwickelt dafur sind linkes Herz und Aorta erweitert

Zweitens wenn die Sauerstoffaufnahme in den Lungen eine ungenugende ist also vor allem bei gewissen Lungenerkrankungen Man rechnet *jetzt auch mit erschwerter Sauerstoffaufnahme* in den Lungen wenn langdauernde Stauung zu anatomischer und funktioneller Schadigung der die Gasanstauung vermittelnden Membranen gefuhrt hat Man hat fur diese Zustande den Ausdruck Pneumonose gepragt Feststellen kann man den O_2 Mangel durch Arterienpunktion und Bestimmung des O_2 Gehaltes eventuell durch Aufsaugen eines arteriellen Bluttropfens in Löschpapier und kolorimetrischen Vergleich nach Tallquist Diese Untersuchung hat uns gelehrt daß der zu geringe O_2 Gehalt im arteriellen Blut nicht entfernt so haufig vorkommt wie fruher angenommen wurde Bei der blauen Mitralstenose kann der O_2 Wert im arteriellen Blut vollstandig normal sein

Diese Tatsache zwingt zur Annahme einer anderen und zwar einer peripheren Ursache der dunklen Farbe des Blutes bei der Zyanose Man hat diese Ursache gefunden in der Verlangsamung des peripheren Blutes in den Kapillaren und den subkapillaren Kapillarnetzen der Haut Das Blut bekommt hierdurch Zeit sogar zu viel Zeit seinen O_2 an die Gewebe abzugeben, die O Ausnutzung so erwunscht bei der Arbeit des Gesunden ist hier ubertrieben groß Fragt man nun nach der Ursache dieser *Blutstromverzögerung* so gibt es auch hier eine Anzahl von Faktoren zu geringe Zufuhr von Blut bei zu geringem Druckgefalle wie bei der Mitralstenose von den Venen herruhrende Stauung ob rechts kardial oder durch Verengerung der abfuhrenden Venenbahnen (Druck Narben Thrombose usw) durch primar periphere Erweiterung der Kapillaren die entweder zu stark gefullt werden wobei sich das Blut an Ort und Stelle anstaut oder durch allzu starke Zufuhr von Blut was normaliter zur Rötung bei ungenugendem Abfließen in die Venen zur Zyanose der Haut fuhrt Endlich durch zu großen Gehalt an roten Blutkörperchen (Polyzythamie) und außerdem erhöhte Viskositat des Blutes welche beide so wirken wie Überfullung

Es ist wie gesagt nicht leicht im Einzelfall diese verschiedenen Ursachen auf ihren Anteil an der Entstehung der Zyanose zu prufen, es ist naturlich auch nicht immer notwendig Die Hauptsache ist daß im allgemeinen die Behandlung auf Beschleunigung des Kreislaufs gerichtet sein muß Alle unsere Herz und Kreislaufmittel können daran mitarbeiten Bei der Besprechung der Digitalistherapie wird darauf Nachdruck gelegt werden daß bei der Verlangsamung der Herztatigkeit und dadurch erhöhtem Schlagvolumen auch ohne erhöhtes Minutenvolumen die Blutgeschwindigkeit gesteigert werden kann um als erster und wirksamster Faktor den eingeschlafenen peripheren Kreislauf zu besserer Tatigkeit zu wecken

Herzfrequenz, Herzrhythmus, Schlagvolumen und Minutenvolumen

Ein Beispiel der schädlichen Wirkung gut gemeinter Regulierungsmaßnahmen welches der Seite 92 besprochenen Erhöhung des Minutenvolumens an die Seite gestellt werden kann bietet die Steigerung der Herzfrequenz bei erhöhtem Blutbedarf Beim Arbeitsversuch ist sie von größter Bedeutung nicht am wenigsten, weil zugleich mit der vermehrten Schlagzahl in der Minute durch Akzeleratorenwirkung die **Kontraktion verstärkt** und in ihrem Ablauf beschleunigt wird Die Kurven der Kontraktion des Kammerdrucks steigen beim Beginn der Systole steiler an erreichen eine größere Höhe und stürzen am *Ende der Kontraktion jäh ab wodurch nebenbei Zeit gewonnen* wird zur Erholung der vitalen Eigenschaften des Herzmuskels Auch die Füllungszeit der Kammern wird durch die verkürzte Schlagzeit verlängert Es kann jedoch diese günstige Wirkung herabgesetzt werden sogar ins Unerwünschte umschlagen sobald folgende Umstände eintreten

a) Der Herzmuskel bringt durch Herzschwäche die kräftigere Kontraktion nicht oder nur mangelhaft auf

Kutschera (l c) hat in seiner Arbeit über Herzschwäche folgende einfache Formel angegeben

$$\frac{\text{Arbeitspause (Diastole } D)}{\text{Wiederherstellungszeit } WZ} = \text{Wiederherstellungsquotient } WQ$$

Da D normaliter reichlich länger ist als WZ ist WQ größer als 1 ($WQ > 1$) Es kann die Frequenz bedeutend zunehmen dadurch D kürzer werden und trotzdem das Verhältnis das gleiche bleiben Gestört wird es erst bei allzu hoher Frequenz (D wird kleiner) oder bei verlangsamter Wiederherstellung infolge Stoffwechselstörung (WZ wird größer) Um so mehr wird das der Fall sein wenn beide Faktoren zugleich auftreten nämlich bei der hohen Frequenz bei Herzmuskelinsuffizienz $\left(\frac{D}{WZ} < 1\right)$ Es darf daran erinnert werden daß diese Verhältnisse bei den experimentellen Untersuchungen an der Abnahme der Erregbarkeit klinisch auch in demonstrativster Weise an der verlängerten Überleitungszeit von Vorhof auf Ventrikel (das A V Intervall des Venenpulses) erkannt werden können

b) Die **Gesamtdauer** der Kontraktionen in der Minute nimmt allzusehr zu wodurch zu wenig Zeit für die Erholung bleibt Das Herz ermüdet also bei $\frac{D}{wz} < 1$ es wird insuffizient treibt das zugeführte Blut nicht in genügendem Quantum aus das Schlagvolumen wird zu klein das Blut staut sich vor dem Herzen an Ein Beispiel dieses Vorgangs liefert die extrem erhöhte Frequenz bei allzulang dauernden Anfällen von paroxysmaler Tachykardie Bei außerhalb der Anfälle körperlich vollkommen leistungsfähigen Personen kann es zu Leberschwellung und Ödemen kommen die nach dem Aufhören der Tachykardie sofort verschwinden (S 30)

c) Es tritt die sogenannte kritische Frequenz ein Diese Erscheinung wird bei der Diskussion der Herzfrequenz zu wenig berucksichtigt trotzdem ist der gestörte Pumpmechanismus des Herzens wichtig genug

In Abb 6 sind Vorhof und Kammerschlage in ihrem zeitlichen Verhaltnis dargestellt und zwar bei steigender Frequenz II zeigt die Kurzung der Diastole (Erholungszeit) Die Kammerfullung wird nur dadurch noch aufrechterhalten daß die Vorhofsystole genau in die kurze Diastole der Kammer fallt daher der Vorhofinhalt ausgetrieben werden kann In III hat sich auch infolge der bei solchen Frequenzen verlangerten Überleitungszeit der Zustand verschlechtert die Vorhofsystole fallt mit der Kammersystole des vorhergehenden Schlages zusammen und findet die Mitralklappe fest verschlossen durch diesen Zustand der Vorhofpfropfung wird der

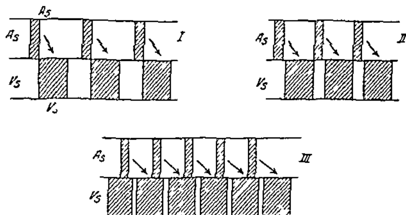


Abb 6 Die Folgen der kritischen Herzfrequenz Die Vorhofpfropfung

Inhalt des Vorhofs in die Venen zuruckgeworfen (sog Pfropfungswellen im Phlebogramm)

d) Die Beschleunigung setzt ein doch bleibt die sonstige augmentatorische Wirkung seitens des Sympathikus aus Wir lernen hier einen nicht uninteressanten Unterschied zwischen den physiologischen und den pathologischen Hochfrequenzen kennen Bei den ersten ist die Herzbeschleunigung von einer Steigerung der ubrigen Grundeigenschaften begleitet die Kontraktilitat nimmt zu Die Reizleitung von Vorhof auf Kammer wird beschleunigt es kommen samtliche augmentatorischen Einflusse des Sympathikus in Aktion

Diese Tatsache ist in der Klinik der Herzunregelmäßigkeiten seit vielen Jahren bekannt und laßt sich am überzeugendsten an dem *Verhalten des Atrioventrikularintervalls (A V)* nachweisen In Fällen von Herabsetzung der Reizleitung infolge Störung im Atrioventrikular Bundel nimmt vorerst die Überleitungszeit zu A V wird länger bis endlich die Leitung ungenugend wird Kammersystolen ausfallen

und schließlich Herzblock eintritt Läßt man solche Personen einen ausgiebigen Arbeitsversuch machen so sieht man nicht selten daß die soeben besprochene Formel Kutscheras (S 99) nicht mehr auf die Vorgänge paßt Trotz höherer Frequenz und kürzerer Diastole wird die Leitung eine bessere die Ausfälle verschwinden alle Reize werden auf die Kammern ubertragen und das *A V* Intervall wird kürzer Das kann so weit gehen daß ein scheinbar vollkommener Herzblock bei schwerer Arbeit in normale Überleitung jedes Vorhofreizes übergeht wir hatten Gelegenheit einen solchen Fall bei einer Bedienerin unserer Klinik täglich zu beobachten Nach der Arbeit verschwindet mit dem Abklingen der Augmentatorenwirkung diese gehobene Stimmung im Herzen wieder Meistens folgt dann eine kurze Periode der Reaktion der Depression welche mit Herabsetzung der Frequenz und gesteigerter Leitungsstörung einhergeht

Diese generelle Hebung aller Herzfunktionen bleibt aus sobald die Tachykardie nicht auf Akzeleratorenreizung beruht sondern aus anderen Quellen stammt Vor allem ist das der Fall bei allen Formen der paroxysmalen Tachykardie die fast immer auf das Aktivwerden von Reizbildungsstellen zuruckgehen die sich im Bereicho der Vorhöfe des Atrioventrikularknotens oder der Kammern befinden Es handelt sich hier um ganz andere Prozesse als bei der Arbeitstachykardie Das gilt auch fur pathologische Tachykardien infolge Fiebers (starkere Erwarmung des Sinusknotens) bei Toxikosen schweren chronischen Schwachezuständen durch Anamie chronische Infektionskrankheiten usw In allen diesen Fallen muß man daher mit der Schadigung der Herzmuskelleistung und der Verringerung des Minutenvolumens rechnen so wie das oben siehe a besprochen wurde

e) Die Arrhythmie des Herzens geht in vielen ihrer Formen mit einer Störung des Pumpmechanismus einher wie beim vorzeitigen Schlagen der Kammerextrasystole welches das diastolische Einströmen des Blutes aus den Vorhöfen in die Kammern beeintrachtigt und (siehe oben) zu Vorhofpfropfung fuhren kann Oder es handelt sich um Kammersystolenausfall bei Leitungsstörungen oder die außerordentlich langsame Frequenz des Herzblocks Auch das Auftreten zahlloser ,frustraner kleiner Kontraktionen beim Vorhofflimmern verlangt große unnütze Arbeit vom Herzen (siehe unter Digitalisbehandlung)

Alle diese Störungen der normalen Schlagfolge des Herzens und seiner Abteilungen wirken sich in Verringerung des Minutenvolumens aus und verlangen daher ihre eigene therapeutische Berucksichtigung

Die Digitalistherapie

Die Möglichkeit einer Erhöhung von zirkulierender Blutmenge und Minutenvolumen bei der Herzinsuffizienz und besonders das hier f die Schädlichkeit höherer Frequenzen Gesagte muß uns vernünf

auch den Erfolg unserer altbewährten Digitalistherapie von diesem Gesichtspunkte aus unter die Lupe zu nehmen

Es war zu erwarten daß Digitalis das Minutenvolumen steigert weil das Herz unter Einfluß dieses Mittels so viel kraftiger schlagt Diese Erwartung scheint aber nicht immer erfullt zu werden es besteht eine fur den Arzt etwas bedruckende Einstimmigkeit in den von verschiedenen Seiten nach Digitalis erhobenen Befunden Das Minutenvolumen bleibt das gleiche oder kann vermindert gefunden werden Man zerbricht sich den Kopf uber diesen scheinbar paradoxen Befund und fragt sich ob nicht die Digitaliswirkung hauptsachlich und zuerst in die Storung des peripheren (Muskel)Stoffwechsels *eingreift*

Diese Frage ist angenommen daß das verkleinerte Minutenvolumen nicht durch Unzulanglichkeit der Methoden vorgetauscht wird, vollstandig berechtigt so sonderbar sie uns auch im ersten Augenblick erscheint Überhaupt mußte man in solchen Insuffizienzfallen in welchen das Minutenvolumen durch die Krankheit **vergrößert** ist erwarten daß durch die Heilung eine **Verkleinerung** eintritt! Es wird angenommen (siehe **Kutschera**) daß Digitalis Digitoxin Strophanthin ein intimes Verhaltnis eingehen (reagieren) mit den atherlöslichen Phosphatiden des Herzmuskels Da nun die Stoffwechselschaden bei Kreislaufinsuffizienz gerade in den Muskeln quantitativ in beherrschender Weise auftreten ware es möglich **daß erst die Skelettmuskeln besser zu funktionieren anfangen die Kapillarisierung und die O_2 Ausnutzung gebessert wurden und dadurch vor allem kein Extrablut mehr zum Herzen geschickt wurde das Herz weniger Blut zu verarbeiten hatte Dadurch könnte das Minutenvolumen kleiner werden** Ob das wirklich der Fall ist bleibt einstweilen unentschieden

Wie dem auch sei wir wollen doch daran festhalten daß die Digitaliswirkung sich vor allem und entscheidend am Herzen außert Diese Wirkung ist eine zweifache erstmals auf die Herzsystole welche sie verstarkt und vertieft sogar bei gleichzeitiger Vertiefung der Diastole wodurch einerseits die Kontraktion direkt gestarkt und auch die diastolische Fullung vermehrt wird letztere ruft nach den dynamischen Gesetzen auch ihrerseits die größere Systole hervor Es ist noch nicht einmal sehr lange her daß diese Tatsache durch die Schule **Magnus** mit verfeinerter Technik absolut sichergestellt wurde Bei **Bylsma** und **Roessingh** 1922 (5) lesen wir , daß wenn bei **gleichbleibender** Zufuhr das Herz nicht mehr imstande war die Gesamtmenge des ihm von der *venösen Seite zufließenden Blutes* zu bewaltigen, **das Minutenvolumen nach Strophantin Darreichung zunimmt** Es muß daher etwas dazugekommen sein wenn das bei der Herzinsuffizienz nicht immer der Fall ist Wahrscheinlich hat die große zirkulierende Blutmenge das Minutenvolumen para

doxerweise gesteigert Mit Rucksicht darauf daß sich nach den bis jetzt beschriebenen Fallen nicht alle Herzen in dieser Beziehung gleichmaßig verhalten ware es möglich das Nichtvergrößertwerden des Minutenvolumens folgenderweise zu erklaren ohne die primare Besserung der Peripherie als **Deus ex machina** heranziehen zu mussen

Das Schlagvolumen wird vom linken Ventrikel geliefert bekommt *zu diesem Zwecke das Blut vom rechten Ventrikel zugeschickt* Wir haben oben (Seite 32 33) wiederholt und nachdrucklich darauf hingewiesen daß bei beiderseitiger Insuffizienz das rechte Herz am meisten erweitert am meisten uberlastet wird am meisten durch die große Blutmenge vor dem Tore zu leiden hat das linke Herz infolge der verringerten Zufuhr seitens des rechten Herzens relativ geschont von allzustarker Überlastung befreit bleibt Aus diesem Grunde durfen wir annehmen daß das linke Herz schneller und ausgiebiger auf Digitalis reagiert als das rechte daher das linke Herz schon gestarkt ist in einem Augenblick da das rechte Herz noch nicht imstande ist größere fur das Minutenvolumen in Betracht kommende Blutmengen auszuwerfen Da das linke Herz nur das von rechts zugefuhrte Blut verarbeiten kann bleibt das Minutenvolumen einstweilen noch unverandert Der Beweis fur diese nur fur den Fall vorgeschlagene Erklarung ware erbracht wenn man nachweisen könnte daß bei der reinen Lungenstauung also bei noch kraftigem rechten Herzen das Minutenvolumen auf Digitaliskörper vergrößert wird hingegen bei vornehmlicher Rechtsinsuffizienz klein bleibt oder gar kleiner wird

Die zweite Wirkung der Digitalis ist die Herabsetzung der Frequenz welche mit ihren langeren Ruhepausen der Erholung des Herzmuskels zugute kommt Dadurch wird zugleich mit der Verstarkung der Systole auch die Fullungszeit eine langere das **Einzelschlagvolumen** nimmt nachgewiesenermaßen zu die Stoßkraft der einzelnen Pulswelle kann durch die Verbesserung der *Herzkraft* gesteigert die arterielle Strömungsgeschwindigkeit dadurch erhöht werden Das kann zur Besserung des Kreislaufs in der Peripherie fuhren auch ohne daß die Summe der an Zahl herabgesetzten Einzelschlagvolumina in der Minute schon ein größeres Minutenvolumen ergibt Auf Druck und Stromgeschwindigkeit mag es hier wohl in diesem ersten Stadium vorlaufig ankommen Außerdem wird der soeben besprochene Wiederherstellungsquotient erhöht und die Formel $\frac{D}{WZ} > 1$ kommt wieder zu Ehren Nun aber kann der bei der Dekompensierung betretene Entwicklungsweg in entgegengesetzter *Richtung noch einmal gegangen werden* die O_2 Not wird geringer es ist weniger Bedarf nach Bluthilfstruppen diese können sich wieder in ihre Ruhequartiere zuruckziehen dadurch wird zugleich mit dem gebesserten Au geschöpftwerden der Stauweiher im großen Kreislauf

die Blutzufuhr zum Herzen mehr verringert Das Herz verkleinert sich und mit dieser geringeren Fullung wird auch das Minutenvolumen kleiner Ein vergrößertes Schlagvolumen wird ja nicht mehr verlangt Naturlich hilft die bessere Durchblutung der Niere infolge vermin derter venöser Stauung bei dem Vorgang der Rekompensierung in wirksamer Weise mit

Es wurde schon kurz darauf hingewiesen daß zu der hohen Fre quenz hinzukommende Arrhythmien die schadlichen Folgen einer

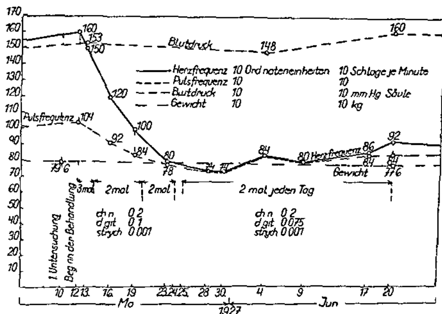


Abb 7 Ablauf der Folgen der Digitalisbehandlung bei Vorhofflimmern Herabsetzung und Ende des Pulsdefizits

stark erhöhten Frequenz noch betrachtlich steigern können Das gilt in keinem anderen Falle so stark wie beim Vorhofflimmern bei hochfrequenter und vollkommen unregelmaßiger Kammertatigkeit Es gibt auch keinen anderen Fall in welchem die verlangsamende Wirkung der Digitalis so deutlich zum Vorschein kommt wie hier Das liegt wohl daran daß die sehr frequenten Schlage nicht imstande sind eine bis in die größeren Arterien sich fuhlbar machende Puls welle auszuwerfen Daher ist die Pulsfrequenz an der Art radialis viel niedriger als die am Herzen selbst durch Auskultation gezahlte Kammerfrequenz (Pulsdefizit) Wie nun der verlangsamende Ein fluß der Digitalistherapie in solchen Fallen wirkt geht aus folgen dem Fall hervor

Fall 12 W ♂ 63 Jahre Hochschulprofessor

War und ist durch seinen Beruf (Geologe) immer sehr mobil In der letzten Zeit Kurzatmigkeit und Beklemmungsgefuhle besonders nach Bewegung kann seine Bergtouren mit den Studenten nicht mehr machen

Stat praes Herz allseitig mäßig vergroßert runde Form (beide Vorhöfe vergrößert) Arrhythmia perpetua durch Vorhofflimmern Frequenz am Herzen gezählt 150 p m Blutdruck 160/103 mm Hg Pulsdefizit 30%! Die Leber ist deutlich vergrößert und härter

Diagnose Kreislaufstörung infolge Vorhofflimmerns bei sonst gesundem Herzmuskel mäßige Hypertonie

Indikation Stabilisierung einer mäßigen Herzfrequenz möglichst ohne Pulsdefizit

Behandlung Digitalis Chinin und Strychnin kombiniert Erst täglich bald in gleicher Dosis nur jeden 2 Tag (siehe Kasuistik S 20 u ff) Der Erfolg zeigt sich in Abb 7 Frequenzsturz mit gleichzeitiger Abnahme des Pulsdefizits das innerhalb dreier Wochen verschwunden ist Von da an Stabilisierung durch etwas geringere Digitalisdosen jeden zweiten oder dritten Tag Der Puls verharrt jetzt durch 3½ Jahre auf günstiger Frequenz der Patient ist leistungsfähig Die Verlangsamung der Kammertätigkeit verschafft dem Herzen längere Erholungszeit die kleinen raschen Schläge verschwinden und rufen durch längere Fullungszeit deutlich fuhlbare Pulswellen hervor Patient verträgt wirksame Dosen ausgezeichnet bei Durchführung des Jeden zweiten Tag Schemas

Epikrise Rein primare Herzwirkung der Digitalistherapie

Einige nicht unwichtige Punkte waren noch

1 Der systolische Blutdruck hat sich nicht geandert der diastolische ist von 105 auf ca 85 zuruckgegangen

2 Das Korpergewicht hat 2 kg abgenommen

3 Der sehr bewegliche Patient hat hie und da leichte Beklemmungsgefuhle Ein Jahr nach Beginn der Behandlung sagte er Wenn ich wieder einmal meine 5 bis 6 Stunden im Gebirge gegangen bin dann geht es mir wieder lange Zeit ganz gut

4 Nimmt er einmal zu wenig Digitalis oder in zu langen Pausen dann steigen Kammerfrequenz und Kurzatmigkeit parallel an

Es scheint also als ob wir fur die Erklarung der therapeutischen Erfolge bei der Digitalisdarreichung noch nicht so grundlich umzulernen hatten nur geht infolge der anfangs zu bewaltigenden an gestauten Blutmassen alles nicht so übersichtlich und einfach vor sich wie es in unserem System dargestellt wurde Wir werden jedoch weitere mit Berücksichtigung der im ersten Teil aufgestellten Stauungstypen durchgefuhrte Untersuchungen abwarten und dabei auf Überraschungen *gefaßt sein mussen*

Die Dyspnoe der Herz- und Kreislaufkranken

Das große Problem der Atemregulierung und der Störungen dieser wichtigen Funktion ist ein so umfangreiches und vielseitiges daß es hier nur kurz zur Sprache kommen soll und auch nur insoweit

Kreislaufinsuffizienz als die Ursache solcher Störungen in Betracht kommt Dabei wird besonders auf die Anderungen welche die Lehre der kardialen Dyspnoe in den letzten Dezennien erfahren hat ein gegangen werden

Allzuviel haben wir uns in fruheren Jahren mit der von Traube aufgestellten Vorstellung Lungenstauung ist der Faktor der den Herzkranken kurzatmig macht zufrieden gegeben v Baschs be kannte Lehre der Lungenstarre infolge Blutstauung in den Lungen schien das ganze Problem erschöpft zu haben wenn auch andere Dyspnoeformen schon die Aufmerksamkeit auf sich gelenkt hatten Wenn es auch keinem Menschen einfallen wird die Lungenstauung nicht als unmittelbare Ursache von Dyspnoe anzuerkennen und die Basch schen Anschauungen einfach beiseite zu schieben ist doch das Atemzentrum jetzt der Mittelpunkt der Forschung und der Er klarungsversuche geworden bei der hier folgenden Skizze wird von der zentralen Funktion dieses Organes als oberster Behörde der Atemregulierung ausgegangen Allerdings steht auch dieser Herrscher so wie das Herz im Dienste der Allgemeinheit

Das Verhaltnis von Kreislauf und Atmung ist ein gegenseitiges Sichhelfen wobei der Kreislauf den Transport besorgt Der im Ka pillargebiet vor sich gehende *Gasaustausch* der zu O_2 *Verminderung* und CO Anreicherung im Blute fuhrt wird in der Lunge wettgemacht durch Aufnahme von O_2 und Abrauchen von CO_2 Das Atemzentrum hat dafur zu sorgen daß beide Vorgange in richtigem Maß und Ver haltnis stattfinden von den augenblicklichen Vorgangen im Kreis lauf wird es durch die O_2 und CO_2 Spannung im Blute benach richtigt Man ist jetzt wohl daruber einig daß es nicht so sehr die Kohlensaure selbst und allein ist welche das Atemzentrum zur Aus lösung starkerer Ventilation der Lungenalveolen veranlaßt als wohl die *Sauerung des Blutes uberhaupt* Es *ist die allmachtige Wasserstoffionen* konzentration welche im Blute aufrecht und auf gleichem Niveau erhalten werden muß erhöhte Sauerung des Blutes aber steigert die Lungenventilation Wir finden uns dadurch sofort auf die Stoff wechselvorgange im Muskel und ihre Störung infolge Kreislauf insuffizienz (S 78 79) zuruckverwiesen und sehen schon allein daraus die innigen Beziehungen zwischen Muskelstoffwechsel und Atem regulierung Die ungenugende Zufuhr von O_2 also auch von dem O_2 Trager Blut laßt die bei der Muskelarbeit entstehende Milch *saure unverbrannt* und beschleunigt nun ihrerseits durch Anregung des Atemzentrums die Atmung

Das Nachlassen der Herztatigkeit und der Blutversorgung der tatigen Organe bringt als erstes Symptom eine bald fuhlbare Atem not Es ist kein Grund vorhanden anzunehmen daß diese kardiale *Atemnot* etwas anderes darstellt als eine *Verstarkung der in nor* malen Verhaltnissen auftretenden Arbeitsdyspnoe Die oben skiz

zierten Stoffwechselstörungen in der Peripherie tragen zu dieser Ver starkung wesentlich bei brauchen aber deswegen nicht das Wesen den Charakter oder die Form der Dyspnoe zu andern Man hatte daher das Recht die kardiale Dyspnoe generell aus dem gestörten Ionenverhaltnis im Blute zu erklaren und einfach zu sagen je starker die Kreislaufinsuffizienz um so starker das Bedurfnis nach Luftung um so intensiver wird der Mensch ventiliert Es ware somit die kardiale Dyspnoe nur ein Spezialfall der Arbeitsdyspnoe

So einfach liegen nun die Sachen doch nicht denn *es können* Kreislaufstörungen auch auf andere Weise die Atemregulierung stören in diesem Falle könnte man dann von einer kardialen oder Kreislaufdyspnoe in engerem Sinne sprechen Solche Störungen können hervorgerufen werden

a) Durch Behinderung der Atembewegungen
b) Durch Behinderung des Gasaustausches in der Lunge
c) Durch zirkulatorische ungunstige Beeinflussung des Atem zentrums

Behinderung der Atembewegungen Hier ware vor allem die von v Basch hervorgehobene Lungenstarre durch ubermaßige Lungen stauung unterzubringen Sie wird zwar uberall zitiert jedoch soweit uns bekannt in der letzten Zeit nicht weiter am lebenden Menschen studiert Man darf wohl annehmen daß jede Anderung der zar ten Struktur der Lunge ihre Ausdehnung und ihr Wiederzusammen fallen behindert und dadurch die Ventilation herabsetzt Die Über fullung der Lungenkapillaren geht nach neuartiger Auffassung auch auf Kosten des Alveolarlumens vor sich der fur Luft bestimmte Raum im Thorax wird dadurch verringert die Lunge kann auch nicht so tief zusammenfallen wie bei normalem Blutgehalt (die Starre) (Siehe Fröhlich *12*)

Eine u E wichtige Hemmung der Lungenbewegung kommt in solchen Fallen zustande in welchen ohne Stauung des Lungen kreislaufs die Atembewegungen auf Befehl des Atemzentrums stark vertieft werden Das Auftreten von Volumen pulmonum auctum ist dabei unvermeidlich

Bei normalen Personen rufen schon wenige tiefe Atemzuge eine kurz dauernde Lungenerweiterung hervor Nach 20—25 tiefen Atem zügen dauert es schon mehrere Minuten bevor die Rippen und das Zwerchfell zur Anfangslage zuruckkehren Ein hubsches Beispiel dieses Vorgangs ist der größere Umfang der Brust nach jeder hyper pnoeischen Periode bei Cheyne Stokes (W *32*) Der Huster bekommt ein vergrößertes Lungenvolumen und zwar infolge des immer wieder vor jedem Husten notwendigen Tiefeinatmens Beim Asthmatiker endlich wird dieser Zustand bedeutend starker er wird schließlich irreduktibel wegen der bleibend behinderten Ausatmung infolge Bronchialverengerung

Dieses Volumen pulm. auctum ist leicht nachweisbar bei solchen Dyspnoeformen, welche vom Atemzentrum ausgelöst mit forcierten und beschleunigten tiefsten Atemzügen einhergehen. In der Literatur (siehe u. a. Wassermann 29) wird darauf immer wieder hingewiesen und wenn man sein Augenmerk darauf richtet, ist man immer erstaunt bei schwer dyspnoeischen Herzpatienten statt Stauungsdämpfung einen überhellen Ton auf der Brust zu perkutieren und die Lungenränder stark nach unten verlegt zu finden. Das kann auch in solchen Fällen zutreffen, in welchen man eher stark gestaute Lungen mit oberflächlicher Atmung erwarten würde (siehe unten). Das Volumen auctum behindert bekanntlich die Ausatmung besonders bei sehr hoher Atemfrequenz, weil die Lungen sich in den kurzen Atempausen nicht genug entleeren können und daher vollgepumpt werden. Das kann also ein wichtiger, wenn auch zu wenig beachteter störender Faktor im Dyspnoefall sein! Diese Form der Dyspnoe kann in der gleichen Weise wie das Asthma bronchiale sich zu einem Anfall ausbilden, der ohne therapeutische Eingriffe sich stundenlang fortsetzt und erst ganz allmählich abklingt. Dieser Art mag wohl auch das Asthma cardiale ohne Lungenstauung im Sinne Wassermanns sein. Es würde sich dann um einen mechanisch hervorgerufenen Circulus vitiosus handeln, um Luft statt Blutstauung in den Lungen. Die berühmte Wirkung der Opiate kann auch bei Annahme dieser Genese des Asthma cardiale Anfalles aus der Beruhigung des übererregten Atemzentrums ihre ungezwungene Erklärung finden. So wie Digitalis die schädliche Herzfrequenz herabsetzt und durch längere Pausen den Herzkammern Gelegenheit zu besserer Füllung schenkt (S. 104), kann schon die Herabsetzung der Atemfrequenz allein die exspiratorische Entleerung der vollgepumpten Lunge und dadurch die Herstellung des normalen Ventilationsmechanismus herbeiführen. Die Erholung des Patienten nach einem Asthma cardiale Anfall sieht der nach Bronchialasthma sehr ähnlich: das Wiederauftreten tiefer, das Luftbedürfnis endlich befriedigender Atemzüge!

Die von Wassermann S. 57 seiner A. c. Arbeit abgebildeten, im Anfall aufgenommenen Atemkurven entsprechen dieser Auffassung in der Hauptsache, jedenfalls bis zum kritischen Augenblicke der letzten Kurve. Die Veränderungen in der wesentlich von der Zwerchfelltätigkeit beherrschten Bauchatmung zeigen die immer kleiner werdenden Zwerchfellausschläge und in Kurve 16 auch dessen tieferes Niveau, welches den Bauchumfang entsprechend erweitert. Erst in Kurve 3, im Augenblicke des eintretenden verzweifelten Atemringens werden die Zwerchfellausschläge sehr klein, vielleicht läßt auch dessen Tonus nach, wodurch dann der Bauch einsinken kann. Ob dabei die von Wassermann in der Bauchmuskulatur vermuteten Krämpfe wirklich vorhanden waren, läßt sich aus der Kurve nicht entscheiden.

Es sei hier jedoch ausdrücklich hervorgehoben, daß bei der bestehenden Ähnlichkeit von kardialem und bronchialem Asthma deswegen eine Wesensgleichheit oder das Einspielen von Bronchialkrampf

beim kardialen Asthma nicht angenommen werden muß Auch andere Faktoren können hier in Betracht kommen (siehe unten)

Herabsetzung des Gasaustausches in der Lunge Stauung jedoch auch zu geringe Blutzufuhr zur Lunge können den Gasaustausch herabsetzen Stauung verkleinert wie wir sahen den Fassungsraum der Alveolen So wie im Kapillarkreislauf der Peripherie die Sauer*stoffausnutzung bei Überfullung geringer sein kann* weil die inneren Blutschichten mit der Umgebung nicht mehr in direkte Beruhrung kommen könnte das auch in der Lunge der Fall sein Übrigens ist die bei Stauung herabgesetzte Strömungsgeschwindigkeit insoweit ein Vorteil als reichlich Zeit zum Austausch gegeben wird Ob der Austausch bis zur Sattigung stattgefunden hat oder nicht kann der O_2 Gehalt des arteriellen Blutes nachweisen

Wird die Überfullung der Lunge sehr stark so kann ein Austreten von Wasser aus dem Blute ins Gewebe und in die Alveolen stattfinden Die Luftbewegung in den Lungen wird dadurch bedeutend verringert die Grenzmembranen sind teilweise von Wasser bedeckt der Austausch wird stark herabgesetzt das kennzeichnende Symptom ist Abnahme des Lungenschalles feuchtes Passeln und erschwerte Atembewegungen Es handelt sich dann um eine echte Lungenstauungsdyspnoe wie z B beim Mitralherzen *Mit dieser Feststellung ist jedoch* weder die Dyspnoe bei Mitralleiden noch das Austreten von Flussigkeit in die Alveolen und Luftwege abgehandelt Wir werden beim Lungenödem darauf noch zuruckkommen Die unwahrscheinliche Angabe daß bei ungeschadigtem linken Herzen eine Rechtsinsuffizienz Stauungsdyspnoe hervorrufen kann soll hier nicht weiter diskutiert werden (S 16) Lungenerkrankungen welche zum Beispiel bei chronischen Stauungsfolgen organi ch den O_2 *Austausch herabsetzen faßt man* unter dem Namen Pneumonose zusammen

Wie sehr verschiedene Faktoren einen Einfluß auf Entstehung und Beseitigung von Stauung und Wasseruberschwemmung in den Lungen ausüben können geht aus den Vorstellungen hervor welche sich Brunn (*4*) über die Rolle des Wasseraustausches Blut—Gewebe gebildet hat Gerade in der Nacht wird wie es scheint, Wasser aus den Geweben ins Blut abgegeben Diuretika fördern dieses Abströmen von Gewebswasser ins Blut Hypophysenextrakt hemmt diesen Strom und gerade dieses Mittel wirkt kupierend auf den Asthma cardiale Anfall! Darf man annehmen daß durch dieses Mittel die Zufuhr von Wasser zum Blute abnimmt, so könnte man sich vorstellen daß die nächtliche Wasserausschwemmung ins Blut als ein Faktor zur Entstehung des Anfalls mitgewirkt hat Brunn nimmt die vorherrschende Wirkung von Drastika wie Jalappe und strenge durchgeführte Trockendiät (Volhard) als Hinweise in dieser Richtung

Ungünstige zirkulatorische Beeinflussung des Atemzentrums al o *nicht durch Zufuhr schlecht zusammengesetzten Blutes* sondern durch zu viel oder zu wenig Blut ist dort zu erwarten wo die Kreislaufinsuffizienz sich hauptsachlich in ungenügender arterieller Blutversorgung außert Schlagen wir unser System der Krei laufinsuffienz

auf so begegnen wir diesem Faktor bei den Aortenleiden inklusive Aortenklappeninsuffizienz bei Mesaortitis luetica, Arteriosklerose und anderen Störungen im arteriellen Kreislauf Auf den ersten Blick sieht es so aus als ob diese Herabsetzung der arteriellen Versorgung keine andere ist als diejenige der ausführlich hier behandelten linksseitigen Herzinsuffizienz Trotzdem haben wir es bei den genannten arteriellen Erkrankungen mit einer ganz besonderen Störung zu tun nämlich mit dem periodischen oder Cheyne Stokesschen Atmen Alle experimentellen Arbeiten und auch die klinische Erfahrung sprechen dafür daß diese Form auf Anoxamie beruht also auf einem Zuwenig an Sauerstoff in und um das Atemzentrum Welcher wäre nun der Faktor der entscheidet ob bei ungenügender Blutzufuhr zum Atemzentrum die schon besprochene Form der Kreislaufdyspnoe inklusive Asthma cardiale eintreten wird — oder periodisches Atmen? Liest man die sehr ausführlichen Betrachtungen Wassermanns über diese beiden Dyspnoeformen, so sucht man vergeblich nach einem springenden Punkt in der Beweisführung In beiden Fällen handele es sich nach W um einen gewissen Grad der Linksinsuffizienz

Zwei Gründe für diesen Unterschied können ins Feld geführt werden a) ein kardialer b) ein arterieller

a) Douglas und Haldane (7) wiesen nach daß Cheyne Stokes Atmen bei Sauerstoffmangel im Atemzentrum entsteht jedoch nur so lange ein bestimmtes Verhältnis zur CO_2 Spannung vorhanden ist Steigt letztere so läßt die durch Überschuß an CO_2 verursachte regelmäßige stark vertiefte Atmung die periodische Atmung nicht aufkommen Man kann den Cheyne Stokes nicht nur durch lange fortgesetzte kräftige O Zufuhr beheben sondern auch und zwar sofort durch Zufuhr von ganz geringen Mengen von CO_2 Daß hier ein sofort einsetzender Reflex von der Nase aus an diesem Effekt den größten Anteil haben sollte wird durch die Mundstückatemversuche unwahrscheinlich Im ersten Fall ist die regelmäßig gewordene Atmung schnell und oberflächlich oder auch nur wogend im zweiten eine zuweilen erschreckend heftige Hyperpnoe mit maximalen Atemausschlägen bemerkbar Hieraus war zu erwarten daß Cheyne Stokes Atmen nur in solchen Kreislaufstörungen auftreten wird in welchen nur die Anoxamie besteht die Erscheinung aber ausbleibt oder, wenn vorhanden, abnimmt wenn die Abgabe von CO an die Alveolarluft relativ ungenügend ist Mit anderen Worten hieße das daß Cheyne Stokes sich in solchen Zuständen entwickelt in welchen die Kreislaufstörung sich auf arterielles System und linke Kammer beschränkt Wo aber *Linksinsuffizienz* (Mitralisierung) mit Lungenstauung oder die große Rechtsinsuffizienz mit behindertem Zutritt zum rechten Herzen und zur Lunge vorhanden sind hätten wir eher das Auftreten von Stauungsdyspnoe oder zentraler Hyperpnoe zu

erwarten Diese Scheidungsgrenze zwischen beiden Formen wurde also bei der Mitralklappe sitzen mit welcher Auffassung wir uns mit derjenigen Wassermanns wieder begegnen Jedoch ist u E nicht ein gewisser Grad von Linksinsuffizienz der entscheidende Faktor Die hier dargestellte scharfe Scheidung zwischen beiden Dyspnoeformen laßt sich leider nicht durchfuhren Fall 3 unserer kleinen Kasuistik (S 22) ist ein klares Beispiel einer Kombination von Cheyne Stokes Stauungsleber und schwerer Zyanose und solche Falle sind nicht so selten wie man glauben könnte Man kann jedoch haufig beim Cheyne Stokes Patienten beobachten daß bei Mitralisierung des Aortenherzens und Zunahme der arteriellen Anamie eine starke zentrale Dyspnoe meistens mit starken Rasselgerauschen als Zeichen der Lungenstauung das Cheyne Stokes Atmen ersetzt In die er Beziehung sind das auch von Wassermann in seiner erwahnten Atemkurve vermerkte Verschwinden einer initialen wogenden Atmung im Asthma cardiale Anfall und das Auftreten einer starken Hyperpnoe von Wichtigkeit

b) Auch ohne linksseitige Herzinsuffizienz tritt Cheyne Stokes bei Behinderung und Einengung des Hirnkreislaufs auf z B bei Erhöhung des Hirndrucks In dieser Richtung aber wirken sich alle jene genannten arteriellen Krankheiten und namentlich auch die zentrale Gefaßsklerose aus Der Verlust von Elastizitat und muskularer Funktion der erkrankten Gefaßwand andert die Bedingungen fur die periphere Blutversorgung und zwar in der Form wie wir dies (S 8) bei der Aortenklappeninsuffizienz kennengelernt haben Die Blutversorgung der Kapillaren wird herabgesetzt und dadurch der Stoffwechsel der durchströmten Organe und namentlich des Gehirns geschadigt Die Vorbedingungen zum Cheyne Stokes Atmen O_2 Mangel und herabgesetzte Erregbarkeit werden dadurch herbeigeschafft interferieren aber nicht mit der Blutluftung in den Lungen oder dem Abfluß des Blutes aus den zum Herzen fuhrenden Venen Der Zustand des linken Herzens erscheint dabei nicht von ausschlaggebender Bedeutung Andererseits ist es selbstverstandlich daß einmal die Bedingungen gegeben der Zustand des Herzens mit entscheidet uber das Auftreten die Intensitat und das Wiederverschwinden dieser Dyspnoeform So tritt ein Cheyne Stokes Typus nicht selten bei alteren *Mannern mit sklerotischen oder luetischen* Arterien in dem Augenblicke auf wo Vorhofflimmern mit frequenter Arrhythmia perpetua schlagartig ein etzt Umgekehrt kann eine eventuell krasse Digitalisbehandlung so sehr die Blutzufuhr zum Gehirn und dem Atemzentrum *verbessern daß der seit Wochen infolge von* Cheyne Stokes schlaflose Patient nach wenigen Dosen schon die erste Nacht ohne Schlafmittel schläft Das schließt nicht aus daß die Vorbedingung zum Cheyne Stokes irgendwo abseits vom Herzen lag bei Nachlassen der Digitaliswirkung dieser Typus sich wieder zeigt

wahrend der gestaute Herzpatient unter den gleichen Umstanden seine kardial verursachte Dyspnoe eventuell Orthopnoe wieder bekommt

Zur Beurteilung der kardialen Atemstörungen am Krankenbette kann es seinen Nutzen haben noch einige Punkte kurz zu beruhren vor allem die Dyspnoe bei Ruhe und Schlaf die Erhöhung des venösen Zuflusses zum Herzen und die Anderungen des arteriellen Wider standes Alle drei können das Auftreten von Atemnot auslösen oder wenigstens fördern

Man wundert sich gewöhnlich uber die Tatsache daß gerade in der Ruhe und im Schlafe wenn das Herz unter idealsten Be dingungen arbeitet gewisse Herz und Atemstörungen sich mit Vor liebe zu offenbaren pflegen Vom biologischen Standpunkte gesehen wundert man sich mit Unrecht Nur Bewegung ist Leben sicherlich fur ein derart mit Bewegungsapparaten ausgestattetes Tier wie der Mensch eines ist Nur wahrend der Betatigung steht unser Kreislauf apparat unter dem fördernden Einfluß aller seiner Regulierungs vorrichtungen Im Schlafe und in der Ruhe sind wir in minderwertigem Zustande es schlaft die ganze Apparatur Wir haben ja gesehen wieviel Arbeit und Muhe es kostet in wachem Zustand aus der Ruhe heraus das Schwungrad des Kreislaufs in Bewegung zu setzen Es ist daher begreiflich daß aus dem Schlafe erwachend uns diese Anpassungsvorrichtungen noch viel mehr im Stiche lassen als wenn wir schon etwas in Bewegung gekommen sind In wachem Zustande wird man der sich nahenden Störungen bewußt und kann schon von Anfang an die teilweise unter unserer Herrschaft stehenden Hilfs krafte der Atmung aktivieren im Schlafe jedoch schleicht sich der Feind unbemerkt ein und wenn man aufwacht ist er schon in der Feste Auch das Atemzentrum schlaft mehr oder weniger und wacht erst zu spat auf

Die horizontale Lage des Körpers bringt einen zweiten Faktor herbei namlich die größere Zufuhr des Blutes aus Rumpf Einge weiden und unteren Extremitaten zum Herzen Ohne auf die Besonder heiten dieses Vorganges einzugehen sei an das uber Orthopnoe Ge sagte erinnert und an das im Liegen starker Gefulltwerden der Hals venen Es ist klar daß die *horizontale Lage fur die unterhalb des Herzens gelegene Körperhalfte* insoweit eine Besserung bedeutet als der venöse Abfluß zum Herzen viel leichter zustande kommt Das Umgekehrte gilt aber fur den Kopf und den Schultergurtel Die Zu fuhr zum Gehirn mag eine leichtere werden der Abfluß wird ver langsamt findet bei viel gefullteren (weniger schnell sich entleerenden) Venen statt und es wurde schon darauf hingewiesen wie auch der Abfluß aus der Vena cava superior in den rechten Vorhof infolge des Andranges von der Vena cava inferior aus behindert wird (S 26) Hier erinnern wir uns auch der von Elias ausgesprochenen Meinung

daß bei der Orthopnoe die gesteigerte Atemnot beim Absinken des *Kopfes auf der Rückwirkung stärkerer Stauungen auf das Atemzentrum* beruhen könnte. Außerdem aber kann die gesteigerte Zufuhr zum rechten Herzen sich auch als Stauung in der Lunge äußern, wenn nämlich das linke Herz die größere Blutmenge nicht verarbeiten kann und das Auftreten von Stauungsdyspnoe (Eppinger) fördern kann.

Vor kurzer Zeit haben auch Carlton, Ernstene und Blumgart diese Vorstellung als neue Theorie des Mechanismus der Orthopnoe in einer klaren Darstellung veröffentlicht. Aus eigener Erfahrung kann an folgende Beobachtung erinnert werden. Wenn man bei einem rechtsgestauten Patienten die Venenstromgeschwindigkeit an der Vena jugularis prüft (siehe S. 26) durch Leerstreichen und distales Zudrücken, die Vene sich entleeren läßt und nun die komprimierende Fingerspitze abhebt, findet man bei stehenden Patienten ein überaus rasches Sichfüllen der Vene vom Kopfe aus. Hingegen kommt es vor, daß man beim nämlichen, jedoch liegenden Patienten ein langsames Zum-Herzen-Kriechen ganz kleiner Blutmengen feststellen kann.

Zu diesen vielen Faktoren der im allgemeinen kardial zu nennenden Atemnot gesellt sich noch ein letzter und wichtiger hinzu, nämlich **der wechselnde Widerstand im aortalen System**. Die im normalen Leben unbeachteten, im pathologischen aber so deutlich eingreifenden Steigerungen, welche der Aortendruck unter den verschiedensten, scheinbar unwichtigsten psychischen und körperlichen Vorgängen zeigt, wurden in einem früheren Kapitel (S. 54) ausführlich betrachtet, so ausführlich, weil man sie immer wieder in Rechnung zu ziehen hat. Handelte es sich damals um das Schmerzhaftwerden der aortalen Stauung, welches sich als Angina pectoris bemerkbar macht, jetzt betrifft es die Auswirkung auf ein seinen Aufgaben nicht mehr gewachsenes linkes Herz. Fassen wir der Kürze halber diese Auswirkung noch einmal in wenige Worte zusammen, so läßt sich sagen: So wie bei kräftigem linken Herzen Drucksteigerung in der Aorta sich in Schmerz äußert, dokumentiert sie sich beim insuffizienten linken Herzen in Kurzatmigkeit (S. 64). Dazu gehören zum Teil die Fälle, die als Angina respiratoria bezeichnet werden, solche, die einmal Angina pectoris hatten, den Schmerz verloren haben und nun auf alle bei der Angina pectoris genannten Einflüsse schmerzlose Atembeklemmung und Asthma cardiale mit oder ohne Lungenstauung bekommen. Jedoch auch bei solchen alltäglichen Mitralklappenfehlern, ob Stenose, Insuffizienz oder beides, wo die linke Kammer *schon auf der Schneide der Insuffizienz steht*, kann sich dieser Faktor eventuell durch das Auftreten feuchten Rasselns bemerkbar machen und auf einschlägige Behandlung (Nitrite) reagieren.

Zu diesem Kapitel gehört u. E. auch das jetzt wieder so viel umstrittene **Oedema pulmonum acutum**. Wer je gesehen hat, wie in einem ersten oder zweiten Anfall der ambulatorischen Angina pectoris der Patient beim Steigen des Blutdrucks plötzlich ein Rasseln

in den Lungen bekommt und nun in rasender Erstickungsangst mit der in seinen Luftwegen aufsteigenden aus dem Blute gepreßten rosa farbenen Flussigkeit auf Leben und Tod ringen muß der wird nicht von dem Gedanken lassen daß die unter Hochdruck ent standene Lungenstauung die Hauptursache das Wesentliche dieses Vorganges darstellt Es ist der Blutdruck in der Aorta der steigende Widerstand den das schon geschadigte linke Herz nicht mehr uber winden kann und nun beim Nachgeben diesen Hochdruck sich hoher stromaufwarts bis in den Lungenkreislauf fortpflanzen laßt Auch die Plotzlichkeit dieses ganzen Vorgangs wobei ein auf Ahnliches nicht vorbereiteter Kreislaufabschnitt getroffen wird und ein noch gar *nicht geschadigtes rechtes Herz zum Überwinden des erhöhten* Pulmonaldrucks mit voller Kraft einsetzt steigert die Not aufs höchste Ob dabei was nicht wahrscheinlich erscheint die Mitral klappe insuffizient wird wie Wassermann meinte widerspricht nicht der Meinung das Lungenödem entstehe meistens unter einem Hoch druck der zum größten Teil von der Aorta herruhrt Steigt dieser Druck so entfaltet sich die Krise erst mit dem Sinken des Blut drucks nimmt das Oedema pulmonum ein Ende!

Der wichtigste Beweisgrund ist hier wie auch in den leichteren Fallen daß der Depressorreflex und das die Peripherie erweiternde Nitroglyzerin den Anfall beseitigen können letzteres kann sogar wie bei der Angina pectoris dem Anfall zuvorkommen Es scheint daher auch begreiflich daß der so ungemein interessante Depressor reflex welcher von dem Carotis Sinus ausgeht sowohl den anginösen Schmerz wie die anginöse Atemnot und das Lungenödem unter brechen kann Beide Mittel wirken im Sinne von Heß als entlastende Regulierungsvorrichtungen Inwieweit und in welchen Fallen diese depressorische Entlastungstherapie Erfolg haben kann wird durch sorgfaltige arztliche Beobachtung im Anfall entschieden werden mussen Jarisch und Ludwig (22) fanden daß die gefaß erweiternden Mittel starker wirken als der reflektorische Eingriff was mit den (S 59) mitgeteilten vorlaufigen eigenen Erfahrungen ubereinstimmt Wie dem auch sei der Kreislaufforschung tut hier vor allem die Hilfe des praktischen Arztes Not denn er ist derjenige unter uns der die hier geschilderten pathologischen Zustande am haufigsten und auch in den dringendsten Fallen zu sehen bekommt

Es wird gut sein die hier gegebene Darstellung der kardialen Atemnot und die theoretischen Vorstellungen uber die Genese ihrer wesentlich verschiedenen Formen nicht als irgendwie endgultig oder entscheidend zu betrachten Namentlich soll man nicht glauben daß die Typen immer selbstandig vorkommen und sich leicht und sicher erkennen und voneinander unterscheiden lassen Einige Beispiele mögen diese Bemerkungen bestatigen Beim fruhnachtlichen Anfall von Asthma cardiale kommt vielleicht sogar in der Mehrheit der

Falle ein starkes feuchtes Rasseln vor ob dieses immer erst sekundar nach einer gewissen Dauer auftritt ist schwer zu entscheiden man kommt meistens erst ans Krankenbett wenn der Anfall schon langst in vollem Gange ist Eigenen Beobachtungen mißtrauend wurden zahlreiche erfahrene Kollegen um ihre Meinung befragt die Antwort lautete meistens Rasseln war vorhanden! Es wird wohl so liegen daß die stauungslose Form im Sinne Wassermanns mit der ausgesprochenen zentralen Hyperpnoe und das Stauungsödem nach Traube und Basch haufig zusammengehen und sich gegenseitig beeinflussen Auch abends schon beim Niederlegen noch vor dem Einschlafen kommen die e Anfalle vor Ist das bei einem Patienten die Regel und erzahlt er daß er im Augenblicke des Einschlafens immer wieder jah aus dem Schlafe und haufig aus dem Bette gerissen wird dann ist fast immer der Cheyne Stokessche Typus der Schuldige (Wassermann) Es wurde oben ausgefuhrt daß Cheyne Stokes und kardiale Dyspnoe sich zwar haufig jedoch nicht immer gegenseitig ausschließen Das Oedema pulmonum hier als vom Verhaltnis Aortendruck —linke Kammer abhangig betrachtet ist nicht immer kardial und kann bei Herzgesunden den Arzt vor eine sehr schwierige Differentialdiagnose stellen

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Wenn nun alles was in diesem zweiten Teil unter Ceteris non paribus vorgebracht wurde den Eindruck des Unfertigen des Unsicheren macht so ist das doch auch das Unvermeidliche All unser naturwissenschaftliches Wissen und Verstehen fließt wie der Blutstrom der Leben und Energie in unseren Gefaßen kreisen laßt es andert sich je nach neuen Befunden und neuer Einsicht Und daß alles auch unser Wissen nur in Relativitat zu nehmen ist gilt fur keinen Wissenschaftler so sehr wie fur den Arzt der am Krankenbette gegenuber den zahllosen unbekannten Faktoren immer nur mit einer verschwindend kleinen Anzahl von bekannten Tatsachen vorliebnehmen muß Nichtsdestoweniger ist es uns ermöglicht durch tagliche Erfahrung weiterzukommen solange wir uns unsere Aufnahmsfahigkeit und unser elastisches Anpassungsvermögen von dem uns der Kreislaufapparat ein Beispiel gab in der fur den Fortschritt unentbehrlichen Frische erhalten

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course in about four weeks with a mortality of the order of twenty per cent A few cases develop osteomyelitis, not infrequently of a rib, and meningitis is an occasional complication

An even more dangerous infection of the small gut spread by infected water, **Cholera,** due to the *Vibrio cholerae,* is endemic in the East and leads to intense small intestinal diarrhoea with rapid dehydration No epidemics have occurred in Europe in this century and the disease is now well controlled, where it is still endemic, by sanitation, supervision of water supplies and inoculation **Epidemic Diarrhoea of Children,** sometimes known as cholera infantum, was common until recently in a hot summer in large cities and carried a high mortality among children of the poor Death, as in Asiatic cholera, was rapid and largely due to dehydration, the post mortem changes in the gut being relatively slight Its bacteriology has never been established With better sanitation, protection of food from flies, and refrigeration, it has now practically disappeared

The small gut can be infected through milk by organisms of the Brucella family, leading to the clinical conditions known collectively as **Brucellosis** Again they are all of the nature of bacteraemia The spleen enlarges and the organisms stimulate a pyrexial reaction of the remitting and relapsing type (hence the term undulent fever), but they do not lead to gastro intestinal symptoms Again there is leucopenia rather than leucocytosis So these diseases often present as pyrexia of unknown origin at first sight, and tend to run a protracted benign course modern chemotherapy still not being very successful in controlling them In the Mediterranean countries a form of Brucellosis called **Malta Fever** (because it was so prevalent at one time among the British garrison there) is endemic and due to *B melitensis,* frequently found in goat s milk In this country the occasional case is not due to the caprine variety of the organism but to *B abortus,* so called because it affects and sometimes causes abortion in cattle

The large gut, unlike the small becomes infected soon after birth the two predominant organisms found in it being the *Bacillus coli* and the *Streptococcus faecalis* In its proper place neither is pathogenic, but they may reach and infect both the biliary and the urinary tracts and this is particularly likely if some mechanical condition predisposes to stagnation of the

flow of bile or urine Of the two organisms the *Bacillus coli* is the most frequent offender Acute cholecystitis characterized by upper abdominal pain, fever and tenderness, is common in elderly patients suffering from gall stones Acute *B coli* pyelitis, leading to "fever, pain and frequency", is common in young women during the early months of pregnancy, partly due to the general dilatation of the ureters which occurs in pregnancy (on account of the increased concentration of oestrogens in their blood) and partly due to obstruction of the ureter by the gravid uterus The condition is usually unilateral, more often right-sided than left, and the dilatation of the ureters, as revealed by pyelography, is always greatest above the level of the pelvic brim In older women who have had many children *B coli* pyelitis tends to chronicity On account of weakness of the pelvic floor the bladder does not empty completely and the pool of residual urine that accumulates serves as a culture medium maintaining the growth of the organisms and infection of the urinary tract

Renal calculi also predispose to infection of the pelvis of the kidney and in men with prostatic obstruction and in patients of both sexes with retention of urine due to diseases of the nervous system infection by the *Bacillus coli* the *Streptococcus faecalis* and sometimes the *Bacillus pyocyaneus* (also an inhabitant of the colon), is a common cause of **Chronic Cystitis** This also occurs in stone and in inoperable carcinoma of the bladder In chronic infection of the urinary tract, and this sometimes occurs for no obvious reason the actual substance of the kidney may also sometimes become infected leading to **Pyelo nephritis** This inflammation is invariably low grade and leads to chronic changes in and dysfunction of the kidney and sometimes to hypertension It will be considered under primary diseases of the kidney (page 184) from which its differential diagnosis is often difficult

Whether **Acute Appendicitis,** which may occur at any age but is most common in children is to be blamed primarily to one or other of these organisms is doubtful Further what starts it is by no means clear Its symptoms are however usually typical sudden pain referred to the umbilicus later settling down in the right iliac fossa cessation of bowel action (occasionally diarrhoea in the case of pelvic appendicitis) fever and

tachycardia Most cases would subside naturally but in view of the risk of perforation, abscess formation and portal pyaemia, the usual practice is to intervene and remove any acutely inflamed appendix as soon as possible

Bacillary Dysentery is acute infection of the colon by one of the dysentery bacilli, which gain access to it via contaminated food and water Epidemics tend to occur during military campaigns as in that in Gallipoli in 1915, and also in institutions, particularly in mental hospitals and homes for old people Sometimes, as in typhoid fever, an epidemic can be traced to a carrier The onset of the disease is sudden with acute blood stained diarrhoea, tenesmus and abdominal pain Death may result rapidly from a combination of toxaemia and dehydration and the mortality is high in children and among old people In this country the Sonne bacillus is responsible for many mild attacks and outbreaks of diarrhoea due to eating infected food As the acute symptoms remit the patient recovers completely Bacillary does not linger on, and become chronic like amoebic dysentery, or cause chronic diarrhoea which in the tropics may be due to infection by many organisms, notably *Balantidium coli*, *Giardia intestinalis* and also, as has been seen already, by the *Entamoeba histolytica* Only bacteriological examination will decide the diagnosis in these cases

Food poisoning is not due to food The idea of poisoning by chemical substances resulting from the decomposition of protein, the so called ptomaines, is dead It is caused by contamination of food or milk by bacteria pathogenic to Man The dysenteries and even typhoid are in a sense food poisoning, an epidemic of Sonne dysentery being a good example of it

Two other classes of organisms cause food poisoning of the common type, i e that associated with gastro intestinal symptoms staphylococci which are liable to grow in milk and milk products, ice cream and cream buns being notorious offenders, and organisms of the Salmonella group which, because they live in the ground, often contaminate meat, vegetables egg powder, and sometimes ducks eggs Both produce chemical toxins which are resistant to heat and may escape destruction in canning Nevertheless, food poisoning by tinned food is uncommon in spite of the quantity now consumed It usually proves to be due to contamination of fresh

food in the kitchen through the hands of some member of the staff who happens to be a carrier of Salmonella or is suffering from a septic finger or discharging boil due to staphylococcal infection, occasionally in the larder by rats or mice Further, there is a peculiar danger in stale food warmed up, which provides the perfect culture medium Sometimes immediate diarrhoea, consequent on the ingestion of the heat stable toxin, is followed, after an interlude, by a second bout due to activity of the organisms in the gut Nevertheless, food poisoning of this variety is seldom severe and its symptoms are usually short lived although the morbidity rate in an institution may be very high Further, it has become more common of recent years on account of the growing tendency to communal feeding and canteen meals

A rare type of food poisoning, **Botulism,** affects the nervous system The *Clostridium botulinus*, like the tetanus bacillus, lives in soil and, like it again, liberates a soluble toxin resistant to heat Further, this toxin, like that of the tetanus bacillus, has a specific affinity for the nervous system Its action is different, however That of *Cl botulinus* attacks the cranial nerves and causes squint, double vision facial paralysis and dysphagia Poisoning is invariably from a tin of vegetables or fruit in which the toxin, and sometimes the bacilli have escaped destruction The mortality is high, the paralysis tending to extend rapidly down to involve the muscles of respiration

Two of the many known tubercle bacilli are pathogenic to Man, the human and the bovine The former can infect cattle (a farm hand with human tuberculosis can infect a dairy herd) and the latter Man through milk Further, human bacilli are peculiarly resistant to drying Having been coughed up in the sputum or breathed out in droplets by a person with open tuberculosis of his lungs, they sink to the floor to lie about for months in the dirt and dust of unclean places So there are three ways of getting **Tuberculosis** drinking infected milk getting bacilli coughed in the face inhaling infected dust

The bacilli get in either through the epithelium of the lung or the mucous membrane of the gastro intestinal tract where the body offers little resistance Thence they travel along the lymphatics to the first gland where they proceed to cause death of tissue, although in most cases the attack is sufficiently gradual

to allow the defences of the body to overcome it The central area of necrosis dries up and is converted into fibrous tissue or becomes the seat of deposition of calcium salts which are opaque to X rays So a film of a chest often reveals a tiny scar far out in one lung field, where the bacilli got in, and a fibrotic or calcified gland at the corresponding lung root, where they were destroyed, the so called **Primary Complex** Further, the reaction of the body to tubercle bacilli has now changed it has become sensitive (allergic) to their protein If an extract of them is injected (the Mantoux test) into the skin of a person who has never met them before, an infant, for example, or an aboriginal who has never been in contact with European civilization, it does not react But anyone else develops a red inflammatory area at this point Now, as age advances, an increasing proportion of people are found to be Mantoux positive and to have a primary complex, which proves that most people (although in these modern 'protected' days fewer than heretofore) get tuberculosis in early life without knowing it, and recover with allergy and, as they never get it again, with immunity

On the other hand, so many bacilli may be inhaled that an infant is overwhelmed and dies of widespread tuberculosis of both its lungs in a few weeks More often they get in at one place only but the nearest lymphatic gland fails to hold them up with the result that they reach the blood stream Sometimes **General Disseminated Miliary Tuberculosis,** tuberculous septicaemia, until recently an invariably fatal disease, results More often they must 'bale out' at some point where they may remain quiescent for a long time For this is what is so often seen clinically some time after primary infection (it is seldom possible to say exactly when that occurred) a patient suddenly starts to develop symptoms in some part of his body remote from his respiratory or gastro intestinal tract where the bacilli must have got through in the first instance Thus a person may suddenly develop tuberculous meningitis, tuberculosis of a kidney or of the spine, or a tuberculous joint

The pleura is also one of the places which suits their way of life A patient may suddenly get pain in his chest, **Tuberculous Pleurisy,** due to stretching of his inflamed pleural membrane and friction between the two layers of his pleura on that side His temperature rises and he feels ill, but he has no cough, and

in a day or two his pain subsides because extravasation of inflammatory fluid now separates the two membranes and relaxes the underlying lung Nevertheless, the prognosis is good The lung itself is seldom affected, and most of the effusion is probably due to an allergic response of the body to the bacilli, the pleural fluid obtained by aspiration of the chest being so often sterile that the non committal diagnosis of primary pleural effusion is usual in these cases although all are probably tuberculous in origin The inflammation subsides and the fluid is absorbed although the pleural space may have been obliter ated, one pleural membrane now being firmly gummed down by fibrosis to the other

Occasionally the pericardium is similarly affected and the pericardium now becomes adherent obliterating the peri cardial sac In fact chronic tuberculosis is one cause of that strange condition **Constrictive Pericarditis** in which the adherent pericardium is often calcified and interferes with the filling of the heart to such an extent that congestive cardiac failure supervenes Further its onset is so gradual that the chronic congestion of the liver which results from it, predis poses to cardiac cirrhosis In many cases therefore ascites, due to portal obstruction and hypo proteinaemia is out of propor tion to oedema of the legs, due to systemic venous congestion

Tuberculosis of the lung substance, **Phthisis,** at one time called consumption may be due to recrudescence of infec tion from within or to reinfection from without Some cases can be traced with certainty to recent heavy exposure to it *In others acquired immunity has declined due to physical* ill health, inadequate diet or diabetes a very important predis posing cause of phthisis, giving organisms already in the lung their chance The patient usually an adult (this type is rare in children) begins to feel unwell Then his temperature is found to be raised and before long he starts to cough Soon he starts to bring up sputum, often blood stained and crowded with tubercle bacilli But the disease may start quite insidiously and is often only diagnosed by finding a small fluffy shadow near the apex of one lung more often on the right side than the left on taking an X ray of his chest

The tubercle bacilli now proceed to cause rapid local necrosis in part due to direct action on the lung, in part

due to the allergic responses of the body sensitized to them So a cavity forms and this ulcerative process may lead to severe haemoptysis or infected material may be aspirated all over both lungs, leading to **Tuberculous Bronchopneumonia,** the galloping consumption which has fired the imagination of so many novelists and playwrights

On the other hand, the local reaction at the site of infection may wall off the area which before long becomes converted into solid fibrous tissue Or the battle may end 'in a draw" The condition is then said to be chronic There is now a cavity in the patient s lung communicating with a bronchus and harbouring tubercle bacilli (capable of infecting someone else through the patient s sputum), but round it there is a wall of fibrous tissue rendering local extension difficult So he is now a greater danger to other people than to himself (In elderly people tuberculosis is often of this chronic fibroid variety) Nevertheless, he is not a really fit man He is suffering from **Chronic Phthisis** and, if for any reason his immunity breaks down, the disease process in his lung may again become active

Diseases Due to Spirochaetes

The spirochaete of **Syphilis** usually gets in through the mucous membrane of the genito urinary tract, where it causes a little destruction of tissue and stimulates a low grade inflam matory reaction but, as this is neither painful nor spectacular, the primary sore (hard chancre) often escapes notice in men and almost always does so in women (Sometimes they get in through the skin leading to an extragenital chancre) Thence they travel quickly to the nearest glands, i e those in the groin Indeed, **Primary Syphilis,** the small sore on the genitalia and the glands in the groin, is therefore comparable to primary tuberculosis, the minute lesion in the gut or lung and the cor responding enlargement of a peritoneal or mediastinal gland Further both tend to pass unnoticed But while tubercle bacilli seldom get past the nearest lymphatic gland and into the blood, spirochaetes *always* get into the blood and the patient is generally infected from the start Treatment must be directed to his whole body and not merely to the primary lesion

The secondary manifestations of the disease appear a few months later The patient may complain of a slight sore throat

or of aches and pains in his muscles All his lymphatic glands may be slightly enlarged He may develop a rash which looks rather like measles, but the rash in **Secondary Syphilis** is seldom spectacular and even a patient in whom primary infection passed unnoticed and untreated may escape secondary manifestations altogether

The tertiary stage starts years after primary infection By this time the spirochaetes have left the blood and settled down like tubercle bacilli in some part of the body which suits their way of life But they have very different habits Tubercle bacilli choose a joint, a kidney, a testicle, a pleural membrane or the apex of a lung, spirochaetes the arteries in the brain, the aorta, the liver, certain bones, or the skin of the leg below the knee Here they proceed to cause structural change And just as the characteristic lesion in post primary tuberculosis is an area of necrosis surrounded by an inflammatory reaction, called a tubercle, so the characteristic lesion in **Tertiary Syphilis** is an area of necrosis surrounded by a low grade inflammatory reaction called a gumma This process gumma formation invariably starts in the wall of a small artery

The functional consequences of gumma formation like those of tubercle formation, depend on the point of attack (What determines that we do not know) When the aorta is affected, its wall weakens and the blood pressure within may cause it to dilate (aneurysm) When the arteries at the base of the brain (usually on one side only) are affected the blood supply may be cut off leading to sudden paralysis of the opposite side of the body (hemiplegia) When the skin is affected usually below the knee, it ulcerates When a bone is involved most commonly the skull or a collar bone a hard swelling develops In all cases early diagnosis is essential if irreparable damage is to be prevented, and in most cases syphilis can be suspected clinically Nevertheless clinical diagnosis is by no means fool proof and we are fortunate in the possession of the Wassermann test which is to syphilis much what the Mantoux test is to tuberculosis The latter depends on an altered (allergic) reaction of the skin to antigen the former on an altered reaction of the blood

Syphilis can also be acquired *in utero*, **Congenital Syphilis** If acquired early, pregnancy ends in an abortion (A history of miscarriages suggests the possibility of syphilis) Infected later

the foetus usually survives to full term but is born dead Infected later still, it is born alive but exhibits secondary manifestations, the primary stage having been gone through" *in utero* Infected later than that the child looks normal at birth but develops tertiary syphilitic lesions at the time of the second dentition Infected very late, it may develop quaternary or para syphilis in its teens

In the tertiary stage the attack on the tissues is via the arteries on which they depend but in **Quaternary** or **Para syphilis** (which tends to occur later still and usually in patients who have escaped both secondary and tertiary lesions) it is on the nervous system direct Further, while the manifestations of tertiary syphilis of the nervous system depend on the particular artery affected, in the quaternary stage the spirochaetes have a peculiar affinity for two particular parts of it leading to two classical clinical syndromes In some cases the posterior columns are affected **Tabes Dorsalis,** with the result that the patient tends to fall over when he shuts his eyes and is compelled to walk on a wide base looking at his legs In others the frontal lobes are mainly affected so that he begins to lose his judgement and suffer from delusions which render his conduct and behaviour peculiar, the condition known as **General Paralysis of the Insane** Unless treatment is instituted in time (the modern treatment is with penicillin), the patient also becomes paralysed and bed ridden on account of cortical involvement of both his pyramidal tracts

Closely allied to syphilis is **Yaws or Framboesia,** also due to a spirochaete, the *Treponema pertenue* Infection is usually by skin contact and not necessarily venereal Once started the disease, which is met only in certain tropical and sub tropical countries runs a chronic course much like syphilis with destructive granulomatous lesions in the skin, mouth and bones The Wassermann reaction, as in syphilis is positive

The *Leptospira icterohaemorrhagiae* is carried by rats and liable to infect men who work in rat infested sewers, leading to **Leptospirosis Icterohaemorrhagica** This disease also occurred in the rat infested trenches of the first World War and an epidemic once broke out in the rat infested fish market at Aberdeen The liver is specifically involved in fifty per cent of cases leading to hepatic jaundice Hence the rather unsatisfactory pseudonym

for the disease, spirochaetal jaundice It may also lead to transient meningitis and nephritis Most cases recover completely after some weeks

There are also a number of fevers characterized by frequent *remissions and relapses, and known collectively as* **Relapsing Fever,** which have been correlated clinically with different spirochaetes in different parts of the world They are rare in England and as they present no other particular distinguishing clinical features, their diagnosis turns, as in the case of most rare fevers, on discovering the offending organism in the blood

Diseases Due to Rickettsiae

A number of fevers are due to Rickettsiae small motile Gram negative bodies, found in and conveyed to Man by the bites of arthropods, such as fleas, tics mites and lice New ones are still being recognized but the only one of importance because it is still endemic in Eastern Europe although it has long since disappeared from this country is louse borne **Typhus Fever,** the jail distemper of the eighteenth century Infection is through the skin and the onset sudden with high fever and intense aches and pains all over the body after an incubation period of about twelve days A characteristic rash macular, papular and petechial appears on the fourth day

Diseases Due to Viruses

A large number of viruses like a large number of bacteria, are nocuous to other forms of life Some cause disease in bacteria (bacteriophage) some in plants for example mosaic disease in tobacco plants some in animals, for example, swine fever in pigs distemper in dogs, psittacosis in parrots foot and mouth in animals of cloven hoof and myxomatosis in rabbits Many are specifically pathogenic to Man Many virus diseases are highly infectious being conveyed from man to man by droplet infection through the air

The commonest is the **Common Cold,** acute inflammation of the mucous membrane of the naso pharynx and often of the accessory sinuses of the nose, predisposing to secondary bacterial infection to which the later symptoms and the purulent nasal discharge are to be attributed

Other viruses get inside the body presumably through the

naso pharynx, without causing any particular local inflammatory reaction Of these the best known are those (they can now be identified by serological tests) which cause **Influenza,** but no very close correlation has been established yet between the particular virus in the body and the clinical symptoms of which the patient complains In general these consist of headache pain behind and on movement of the eyes and in the muscles, and not infrequently some kind of gastro intestinal upset, so called gastric flu ' There is usually an associated *tracheo bronchitis Occasionally influenza causes acute consolidation* of the lung which may now become secondarily infected by streptococci or staphylococci and is sometimes fatal Another much rarer virus infection is **Psittacosis,** caught occasionally by Man from birds of the parrot tribe It is also characterized by consolidation of the lung with severe systemic symptoms

Other viruses getting inside the body cause characteristic maculo papular rashes from which infection by them can be inferred with certainty For example, the virus of **Measles** (morbilli), after an incubation period of ten days, leads to coryza, with Koplik s spots inside the mouth, and three days later to a characteristic rash on the trunk and extremities It is not a dangerous disease in itself but as it renders the whole respiratory tract liable to secondary infection, it is a frequent cause of middle ear disease, acute mastoiditis, bronchitis and bronchopneumonia in children **German Measles** (rubella), on the other hand, must be due to a different virus because, although the rashes are not altogether dissimilar, one disease does not confer immunity against the other Further, in german measles the incubation period is much longer, the initial coryza absent and secondary infection much less common, although for some reason the cervical glands are characteristically enlarged Occurring in a woman in the early months of pregnancy it may interfere seriously with foetal development leading to congenital conditions such as cleft palate and malformation of the heart

Other general virus infections lead to generalized vesicular eruptions Of these the most serious is **Smallpox** (variola), although it is now on the decline, partly due to vaccination against it with the virus of **Vaccinia** (a mutant either of the

virus of smallpox or that of cow pox), public health measures and a world wide decline in its virulence for reasons not yet understood After an incubation period of about twelve days the disease is ushered in by high fever and intense pain in back and head, followed in a day or two by a rash on the face and limbs which starts as papules develops into vesicles and ends as pustules By way of contrast **Chicken pox** (varicella) is a very mild affair After an incubation period of about a fortnight the patient feels mildly unwell and then papules appear mainly on the body and develop quickly into vesicles Further, the rash, instead of appearing all at once, develops in waves starting on successive days The only diagnostic difficulty lies in the dis tinction between a severe case of chicken pox and a case of smallpox modified by previous vaccination

A local vesicular eruption may also be due to virus infection Sometimes it corresponds in distribution to an area of skin which sends all its afferent fibres into the central nervous system by the same sensory nerve root This condition **Herpes Zoster,** is due to infection of the posterior root ganglion and its corresponding skin area by the virus of varicella Indeed, zoster may follow fourteen days after exposure to chicken pox or chicken pox fourteen days after exposure to zoster More often zoster starts suddenly for no apparent reason, the first symptom being pain in one side of the face, round one side of the body or down a limb Then, two or three days later the rash appears revealing the cause of the pain, the virus, it is said, travelling down the sensory nerve to reach the skin (it can be recovered from the vesicles) just as the toxin of the tetanus bacillus travels up the motor nerve to reach the nervous system It is very rare to get either herpes zoster or chicken pox twice although a person who has had chicken pox in childhood may get zoster in adult life

A vesicular rash in the neighbourhood of a mucous mem brane skin junction, on the other hand, that is to say, round one of the orifices of the body, **Herpes Febrilis,** is also due to a virus that lies latent in the tissues as evidenced by the fact that a person often gets an attack in the same place on the lip or in the eye whenever he gets a cold or some other acute infection particularly pneumonia This virus never spreads and leads to no serious complications

As many viruses have an affinity for the skin, it is not surprising, as already exemplified in zoster, that they should have an affinity for the nervous system which like the skin is ectodermal in origin. All the generalized virus diseases already mentioned, namely chicken pox, smallpox, measles and even german measles, can be complicated by **Encephalitis**. On rare occasions vaccination seems to precipitate it, usually vaccination for the first time at school age, suggesting that it is probably not due to the virus of vaccinia *per se* but to the lighting up of a virus already in the body. Other viruses attack the central nervous system without affecting the skin. For example, **Rabies** (hydrophobia) is a form of encephalitis due to a virus common in the saliva of dogs and jackals in the East. Hence the danger there of the bite of a mad dog. Another peculiar form of encephalitis, **Encephalitis Lethargica,** appeared in 1916 and spread across Europe and has now practically died out. It was characterized by lethargy and paralysis of the oculo-motor nerves and in many cases led to permanent damage to the basal ganglia resulting in **Post encephalitic Parkinsonism,** a condition in young people at that time which closely resembled in its slow movement and rigidity the condition described by Parkinson under the name of paralysis agitans. Every now and again a case is met that looks just like tuberculous meningitis, headache, fever, drowsiness, some head retraction and a lymphocytic meningeal reaction as evidenced by examination of the spinal fluid. But no tubercle bacilli can be found in it and the patient recovers without chemotherapy. These cases are described as **Acute Benign Lymphocytic Meningitis,** almost certainly another virus disease.

Poliomyelitis, which tends to occur in small epidemics during the summer months, is an acute infection of the nerve cells in the anterior horns of the grey matter of the spinal cord. Not all cells at all levels are affected. Rather, after an initial constitutional disturbance followed often by pain and stiffness in back and neck due to meningeal irritation, one or more muscle groups suddenly become weak, certain anterior horn cells having been picked out, those most in use, and therefore those supplying the leg muscles and those operating the respiratory muscles being most often affected. (Very rarely the disease involves the cranial nerves.) The nerve cells affected,

and therefore the function of the muscles which they supply, usually recover after a few days if the patient is properly cared for, although some paralysis is often left behind. So poliomyelitis may be a crippling disease. Further it is peculiarly difficult to prevent it as only a minority of cases develop paralysis. The rest pass unrecognized and it is these undiagnosed cases which spread "polio" about and account for its occurring unexpectedly at places wide apart even in an epidemic.

Other viruses which get inside the body have a particular affinity not for skin or nervous system, but for other organs. For example **Mumps** is due to a virus which has a curious affinity for the parotid gland leading to pain and swelling just above the angle of the jaw. The other salivary glands are sometimes affected and so are ovaries, testicles and pancreas. A history of mumps provides a possible explanation of sterility in either sex. Mumps is also a possible immediate cause of obscure pain in the upper abdomen or female pelvis. Another virus has a specific affinity for the liver leading to **Virus Hepatitis.** After two or three days of slight fever, anorexia, nausea and general malaise, the patient becomes jaundiced, revealing the diagnosis. Liver and spleen are now palpable. In the absence of jaundice clinical diagnosis is impossible and, as only a relatively small proportion develop it, virus infection of this kind is probably much more common than is generally supposed, spreading the infection round and accounting for the apparently sporadic incidence of virus hepatitis. Almost certainly too closely allied to the virus of hepatitis is that which causes **Infective Mononucleosis** (glandular fever) characterized by fever often prolonged, enlargement of glands all over the body and the appearance in the blood of a large number of lymphocytes of a certain type. Indeed, both diseases can occur together suggesting that occurring singly they may be due to the reactions of different constitutions to the same virus. Both can be complicated by encephalitis.

Modern medicine has also to reckon—for virus disease is clearly on the increase—with **Virus Pneumonia,** sometimes referred to as pneumonitis. There is seldom any history of bronchitis and the disease comes "out of the blue," attacking perfectly healthy lungs. It seems to have replaced lobar pneumonia in that particular respect. Both lungs are usually

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affected There is little sputum, lymphocytes rather than polymorphonuclear cells are increased in the blood, and the X ray shadowing is often out of all proportion to the physical signs in the chest Further, this disease is frequently associated with influenza like pains in the limbs and not infrequently follows a common cold Finally, there seems little doubt that mild virus infection of the respiratory or gastro intestinal kind can lead to a prolonged period of sub normal health charac terized by depression, lethargy, anorexia, constipation and sometimes by hypotension Whether in the present state of knowledge it is really justifiable to apply the term **Chronic Virus Disease** to these cases (which seldom get into hospital' although every general practitioner is familiar with them) is a matter of opinion

CONGENITAL DEFECTS

A certain proportion of all children, about one per cent, are born abnormal in some respect This may be due to a known inherited genetic defect, or to known factors adverse to develop ment which were operating *in utero* Congenital abnormalities in this category have already been described Many others cannot be explained so simply For no apparent reason a child is born with accessory nipples, a missing or supernumerary digit, webbed fingers or toes, an occluded bile duct or an imperforate anus Its maxillary processes may have failed to fuse completely or partially, on one or both sides, giving rise to unilateral or bilateral cleft palate or hare lip Its external genitalia may have failed to form properly so that its sex is indeterminable at birth Some of these conditions are unimpor tant Others lead to progressive failure of function or predispose to infection creating problems both in diagnosis and in treatment

Malformation of the Heart

In three out of every thousand children the heart does not develop properly, the defect varying between one compatible with an almost normal span of human existence and another almost incompatible with life at all (It is often associated with some other congenital abnormality) In a few cases there is a

history of rubella in the mother during that pregnancy On the other hand, statistics show that the incidence of congenital malformation of the heart in a sibling or other near relation is greater than it should be on the basis of pure chance and dextrocardia is actually inherited as a Mendelian recessive Facts such as these suggest genetic factors in the pathogenesis of many cases *

The bundle of His may fail to develop Then the pulse is slow but never as slow as in the acquired heart block of adults The aortic valve may be stenosed or the aorta narrowed at some point just below the origin of the left subclavian artery, **Coarctation of the Aorta,** in which case the blood supply to the legs is only maintained by a system of anastamosing arteries extending down the chest Both these conditions predispose to left heart failure

There may be a communication between the two sides of the heart, an **Atrial** or **Ventricular Septal Defect** or a **Patent Ductus Arteriosus** Under these circumstances some blood must pass across from the left to the right side (an AV shunt) inevitably increasing the blood flow through the lungs and predisposing to right heart failure Then the pressure in the right ventricle may rise sufficiently high to reverse the direction of the shunt and under these circumstances the patient develops central cyanosis due to incomplete oxygenation of his arterial blood Further, a patent ductus arteriosus, like a bicuspid aortic valve (the latter an undiagnosable condition during life), predisposes, for reasons not understood, to infection by non haemolytic streptococci leading to subacute bacterial endocarditis

When in addition to a communication between the two sides of the heart some factor operates *from the start* to reverse the natural direction of the shunt, central cyanosis is inevitable at birth The commonest cause of this is **Congenital Pulmonary Stenosis,** raising the pressure in the pulmonary artery and leading to hypertrophy of the right ventricle Indeed, **Fallot's Tetralogy,** the title granted to the association of a patent inter ventricular septum, pulmonary stenosis an aorta overriding the right ventricle and an hypertrophied right ventricle, is the commonest cause of cyanosis at birth

* For a further discussion of this subject see page 39

Malformation of the Lungs

One or other of the lungs may fail to develop, **Pulmonary Agenesia,** or a lobe develop without a bronchus in an otherwise normal lung, a **Sequestrated Lobe** Cysts lined by respiratory epithelium without any obvious communication with a bronchus are often associated with congenital malformation elsewhere A **Solitary Cyst** may be so large as to be mistaken clinically for a pneumothorax Multiple cysts, **Polycystic Disease,** give rise to a honeycomb appearance in an X ray of the chest

Malformation of the Kidneys

Polycystic disease of the kidneys leading to renal failure, a genetic condition, has already been described (page 41) The causes of other malformations of them are not understood Both kidneys may be absent, a condition incompatible with life, or they may be connected across the mid line, **Horse-shoe Kidney** The ureter may be duplicated on one or both sides or start double The two ureters may join before reaching the bladder One or both kidneys may be deficient in renal units (nephrons) predisposing to renal failure, although it is difficult to be certain whether this is truly congenital in the individual case, as it may also be caused by infection in very early life and all congenital abnormalities of the kidney predispose to infection Sometimes both ureters and renal pelvis are dilated, **Congenital Hydro-nephrosis,** leading to renal atrophy and progressive renal failure The likely explanation of the condition would seem to be some neuro muscular defect of the ureteric orifices or of the internal sphincter of the bladder Far more common and important is kinking of one ureter by an **Aberrant Renal Artery** on one or both sides predisposing to hydronephrosis and infection Cases of this kind usually present as acute pyelitis, or, when the kidney is movable, with attacks of renal pain

Congenital Dysfunction of the Gut

Sometimes a child starts to vomit about two weeks after birth This usually proves to be due to maldevelopment of the nerve plexus on which the co ordination of gastric peristalsis and pyloric relaxation depends Under these circumstances the

pylorus gradually undergoes hypertrophy throwing the mucous membrane within into folds which before long organically block its lumen This condition, **Congenital Pyloric Stenosis,** is more common among the Teutonic than the Latin races and boys are much more often affected than girls facts suggesting a genetic element in its pathogenesis On the other hand, it occurs surprisingly often in first children of a family an observation more in keeping with the idea that some intra uterine factor must be largely responsible for it But, whatever its cause, most cases properly treated recover completely Whence it must be concluded that given time and a chance, proper neuro muscular control of the pylorus becomes estab lished naturally

Other children are constipated from birth and one cause of this is congenital failure of development of the ganglion cells *in the nerve plexus at the junction of the sigmoid colon with* the rectum Then this section of the gut fails to carry out its share of the muscular work associated with the filling of the rectum and the expulsion of the faeces resulting in chronic constipation The abdomen becomes distended, due to hyper trophy and dilatation of the colon above while the rectum below remains empty distinguishing the mega colon of this condition **Hirschsprung's Disease,** from that of primary functional con stipation the misuse of aperients and faecal impaction Unlike pyloric stenosis it is more common in girls than boys Further than that nothing is known about its aetiology

In **Coeliac Disease** the small gut fails to absorb the products of digestion of protein, carbohydrate and fat So its symptoms may be almost identical with those of fibrocystic disease of the pancreas (page 45) a genetic disease in which failure of absorption is secondary to failure of digestion The abdomen becomes distended and characteristically doughy, while the stools are large pale and greasy, due to undigested fat frothy, due to fermentation of carbohydrate and offensive, due to decomposition of undigested protein Meanwhile the infant fails to gain or actually loses weight

A similar condition of identical functional pathology is met in rather older children and usually labelled non committally **Idiopathic Steatorrhoea** It may have been acquired after birth but on the whole it seems more likely that these are mild

cases of coeliac disease which have escaped recognition in infancy, particularly as they are often associated with a tendency to dwarfism and infantilism The child is under nourished and often anaemic, owing to failure to absorb iron or the haemo poietic factor, and may suffer from delayed rickets, owing to failure to absorb calcium, and from a pellagra like condition of its skin owing to failure to absorb vitamin B Sometimes a tendency to steatorrhoea is discovered quite late in life in a person losing weight or complaining of diarrhoea Here again it is impossible to say whether this has been acquired or whether it has merely been revealed by circumstances, but the latter is often suggested by the fact that symptoms of this kind are precipitated by eating gluten found in certain breads or by the operation of gastro enterostomy Further, **Tropical Sprue** presents with all the clinical features of steatorrhoea But again, whether this is a disease all on its own or merely an unsus pected tendency in the direction of failure of fat absorption brought out by residence in the tropics and alteration of diet is difficult to ascertain

Congenital Malformation of the Gut

The oesophagus may be congenitally so short that part of the stomach develops above the diaphragm or is gradually drawn up through the hiatal opening into the chest This is one cause of **Hiatal Hernia** Most cases, however, are due to build, obesity and a chronic cough, the latter raising the abdominal pressure and forcing part of the stomach up through the hiatal opening, which may have been congenitally weak, into the chest Sometimes the whole stomach develops in or gets into the chest the patient presenting with respiratory symptoms More often he complains of difficulty in swallowing, hiatal hernia predisposing to peptic oesophagitis

Congenital diverticula are sometimes found in the wall of the gut Most oesophageal ones are caused by traction from without, due to inflammatory adhesions or by increased pressure from within due to swallowing hard lumps of food But an **Oesophageal Diverticulum** can be truly congenital and when sufficiently large can give rise to difficulty in swallowing In the small gut congenital diverticula are usually symptomless but in the colon where they are much more common and

often aggravated by constipation, they predispose to infection **Acute Diverticulis** gives rise to pain, fever and diarrhoea, and may perforate leading to general peritonitis or a pericolic abscess Chronic diverticulitis is a cause of chronic diarrhoea

In about two per cent of all births, more often in boys than in girls the vitelline duct persists as **Meckel's Diverticulum** attached at its peripheral end to the umbilicus In the vast majority of cases it never gives rise to any trouble and is only discovered on post mortem examination Nevertheless in childhood it may form the starting point of an intussusception or, as it sometimes contains ectopic gastric mucous membrane and oxyntic cells capable of secreting hydrochloric acid, ulcerate and lead to sudden intestinal bleeding At any age as it constitutes a band across the abdomen it may lead to kinking of a wandering loop of gut and precipitate acute intestinal obstruction

The large gut is sometimes the site of polypi at birth, but as these are to be regarded as benign neoplasia, and rectal polypi are peculiarly *liable to become malignant,* they will be described later (page 213)

Congenital Abnormalities of the Nervous System

Chronic hydrocephalus, i e pathological accumulation of fluid inside the skull, may be internal i e limited to the ventricles or communicating i e involving both the ventricles and the subarachnoid space over the surface of the brain and even down the spine (hydromyelia) The former is usually due to blocking of the aqueduct of Sylvius or the foramina of Luschka and Magendie the latter (communicating) to excessive secretion of cerebro spinal fluid by the choroid plexus or to some fault in its reabsorption **Congenital Hydrocephalus,** several cases of which may occur among blood relations is however always internal and usually due to blocking of the aqueduct or the foramina of Luschka although it is often difficult to see after death exactly what happened mechanically during life Frequently it is associated with other malformations of the nervous system, notably spina bifida and meningocele and myelodysplasia The worst cases are incompatible with life or even with birth In some as the head enlarges the child develops spastic paraplegia optic atrophy or epilepsy Others grow up mentally

deficient But in many lesser cases the flow of cerebro spinal fluid must, clearly, become established For the only legacy of a slight degree of congenital hydrocephalus may be an exceptionally large head

Gross failure of development of the cerebral hemispheres, **Anencephaly,** is incompatible with life Lesser degrees of cerebral development are among the causes of amentia Mental deficiency, as has been seen already, may be due to genetic causes, as in Huntingdon's chorea, amaurotic family idiocy and hydrocephalus, or to genetic incompatibility between mother and child It may also be due to faults in development not yet understood, for example **Microgyria** (small convolutions), or to premature union of the sutures in an infant s skull forcing it into some abnormal shape, for example, **Oxycephaly,** interfering with the development of the brain beneath Sometimes the brain and skull look normal and amentia is associated with physical peculiarities of the body, as in **Mongolism** This tends to occur in the later children of large families and in those of elderly mothers, suggesting advancing maternal age as a factor in its pathogenesis On the other hand, there is almost certainly a genetic factor No instance has ever been reported of only one identical twin being mongol and evidence has come to hand recently that there is an extra chromosome in the fertilized ovum whence the mongol is derived (Compare with Klinefelter s Syndrome page 47) A state of happy idiocy is associated with flat neck, folds across each inner canthus, narrow tilted eyes, lids without lashes, fissured tongue, depressed nose, small facial bones and a mop of coarse dark hair

THE PSYCHOSES

Failure of development of the mind, amentia, may be due as has now been seen, to some genetic defect, to adverse factors operating *in utero*, to rhesus incompatibility between mother and child or to congenital maldevelopment of the brain the cause of which is not yet understood Congenital or early acquired blindness and deafness are also bound to interfere with mental development Further, some children grow up imbecile i e incapable of looking after their own needs, or feeble minded, i e requiring education at special schools, in spite of the fact

that the structure of their brains appears normal and their environment is beyond reproach

The developed mind is bound to be affected when any pathological process affects the frontal lobes or any function of the body on which they depend Thus, as has been seen already mental disorder may be due to vitamin deficiency, dehydration chemical poisoning and infection, and may also be due to many of the pathological processes to be described in the sections that follow Disorders of mind produced in this way are known as the **Organic Psychoses** Acute cases are character ized by confusion chronic ones by progressive intellectual defect (dementia), namely loss of memory, of the capacity to reason of judgement and of initiative The emotional level of the mind, except in so far as it may be influenced by some delusion, is *seldom much affected*

Another group of mental disorders best referred to simply as the **Psychoses,** are characterized by primary disturbance of affect (emotional feeling), rather than by intellectual defect, at least in their early stages Further, they cannot be explained in terms of any known pathological process affecting the brain, which looks normal even under the microscope or in terms of failure of any function of the body on which it depends Nor can they be accounted for in terms of mental stress Rather it seems almost certain that they *must* be due to some peculiarity presumably of a physico chemical kind and probably genetic in origin predisposing and even predestinating the patient to mental breakdown of a certain type So they are regarded as due to organic disease *in spite of the fact* that no changes can be found in the brain after death * But there is and can be no absolute line between them and the normal mind, the reactions of all human minds being to some extent body dependent and genetically determined Nevertheless there is a point in the continuum of human personality at which an individual can be recognized as being definitely psychotic and his behaviour likely to become seriously even dangerously disordered Further it is possible up to a point to classify mental breakdown

* The term *f nctional* should therefore not be used in order to distinguish them from the organic psychoses as it obscures their essentially organic nature It is better to talk about the *organ c psychoses* due to known organic disease of the brain or failure of some function of the body on which it depends and simply of the *p y hoses* probably largely due to genetic defect.

of this psychotic kind into a number of reaction types or mental diseases with a view to diagnosis, prognosis and treatment

A certain number of adolescents tend to grow up introvert to varying degrees They are tied up in themselves, make few friends and are often self conscious and retiring They are also sensitive, and find it hard to accept life as they find it, and, often above average intellectual ability, ask too many questions of it "Weary of myself and sick of asking what I am and what I ought to be," wrote Matthew Arnold The lot of the introvert is not a happy one Further, this type of personality seems peculiarly liable to a form of psychotic breakdown known as **Schizophrenia,** which is almost certainly due to some inborn peculiarity conditioning the reactions of the mind to experience and permitting, like certain drugs, notably mescalin and lysergic acid, of peculiar detachment from reality Evidence in favour of this view is derived from several sources It usually starts between fifteen and twenty five and is more common in males A family history of it, or of some kind of mental break down, can often be obtained If one identical twin develops it, so, often, does the other too Further, schizophrenics are of certain constitutional type They are usually weedy and lanky with cold clammy hands, due to a poor peripheral circulation, and low blood pressure, and tend to get polyuria and to react poorly to ephedrine and insulin Their metabolism is also often abnormal in the sense that the concentration of sugar creatinine and non protein nitrogen in their blood fluctuates within wider limits than in the ordinary person

Whether the potential schizophrenic actually breaks down depends entirely on the strength of his genetic predisposition and the amount of stress to which he is subjected Sometimes the disease starts abruptly, **Acute Schizophrenia,** precipitated by taking on too much responsibility, by forced publicity, by marriage and occasionally by physical ill health The patient's conduct suddenly becomes peculiar He may start doing odd things or behaving in some strange way, or lapse into a stupor ous state out of which it is impossible to rouse him Under these circumstances it is necessary to get him quickly under observa tion and restraint

Most potential schizophrenics succeed in living fairly normal lives, however, provided their circumstances are not too

exacting and much can be done to prevent them breaking down The trouble is that they are often highly intellectual and of great promise with the result that they tend to be forced into or to take up of their own free will work or professions to which they are quite unsuited Then if the patient s inborn predisposition is *too* strong or the circumstances of his life now *too* difficult he may begin to withdraw from the real world into himself with the result that it becomes difficult to establish psychological contact with him and get inside ' his mind This also explains that disharmony between mood and thought which is so characteristic He laughs at human tragedy for example, although he still fully understands its import The real world is ceasing to matter to him and at this point he begins to lose all affection for his relatives and friends Then he may start to get delusions born of the unreal world in which he is beginning to live and into which it is impossible for his doctor or his friends to penetrate Further, this unreal world accounts not only for his delusions but for his now strange conversation drawings and writing His thinking becomes more and more symbolic and infantile in type and before long his utterances and conversation even more peculiar, his drawings and paintings even more fantastic He may become depressed and sink into a state of chronic melancholia sitting hour after hour in a state of abject dejection Or he may live beset by some strange delusion the hebephrenic type, or by one of persecution, the paranoid type Many are negativistic in the sense that they actively and consistently resist any tentative approach Put out a hand and they withdraw theirs walk towards them, and they back away Others become catatonic, standing rigidly statuesque often in strange positions, for hours without any semblance of fatigue

Depression which strictly speaking is a symptom, i e a disorder of function which can be due to many different pathological processes may be justified by circumstances, although not necessarily of the kind about which the patient is prepared to talk at first This is known as **Reactive Depression** It rarely leads to suicide and seldom lasts long For time is kind and grief remits the human mind like the human body, possessing a remarkable power of adaptation and recovery Indeed, human experience teaches that hope springs eternal in

the human breast and history that the human mind can rise superior to most circumstances Even in the absence of religious conviction some semblance of hope normally persists in old age

Depression may also be due to physical disease, **Organic Depression,** and depression of this kind is really one of the organic psychoses Rarely is it due to any pathological process of the brain itself, however, its commonest causes being the toxaemia which follows in the wake of influenza and virus hepatitis Further, depression at the menopause and in people who suffer from functional disturbances of the colon is in part physical and therefore organic

Certain healthy people, usually men in adult life, are peculiarly liable to recurrent attacks of depression which come on suddenly for no apparent reason In this, **Endogenous Depression,** i e depression coming from within, the normal capacity to enjoy life dries up altogether The patient can no longer cope with his problems All the operations of his mind are retarded The future appears blank and destitute of hope Living has ceased to be worth while Hence the risk of suicide enhanced by the fact that he cannot sleep He goes to sleep but wakes up in the early hours and lies awake unable to get off again oppressed by thoughts of death and hopelessness Some times he develops a conviction of unworthiness or of guilt, occasionally a definite physical delusion The predisposition to get these attacks is almost certainly genetic and most patients are of the so called pyknic type, red faced, short necked, broad chested In most cases too there is a history of previous mental illness in the family On the other hand, something must precipitate them and the patient is certainly physically ill Gastro intestinal function is frequently grossly disturbed But whether this comes first, and leads to depression, or the depression comes first and upsets the gastro intestinal tract, has not yet been decided Anyhow after a few weeks or months, the patient recovers the normal emotional level of his mind *naturally* although he is always liable to get a further attack, and people who suffer from long drawn out recurrent attacks may sink into a chronic melancholic state

Mania like depression is also, strictly speaking, a symptom rather than a disease It can be due, for example to drugs, notably alcohol and to high fever, but it may also be the result

of a psychosis and tends to occur in men and women of much the same physical type as those liable to endogenous depression The emotional level of the patient s mind rises and he begins rushing about, a succession of ideas flying through his over active brain, his conversation a disconnected stream of talk He is hilarious, excited, often so busy starting first one thing, then another (but finishing nothing), that he has no time for sleep Yet he exhibits little evidence of fatigue In a severe case delusions born of imaginary wish fulfilment soon begin to add to his excitement and start to dominate his behaviour But acute mania cannot last long and, short of some disaster, eventually subsides, or the patient lapses into a hypomanic or chronic manic state, although after a while he may get another attack precipitated by acute infection or exacting circumstances More often attacks of this kind come on for no apparent cause just like endogenous depression

Most people who suffer from attacks of depression do not get attacks of mania and those who get attacks of mania do not usually suffer from endogenous depression On the other hand, it is a matter of common observation that many people are by nature *cyclothymic i e liable to fluctuations of mood, unduly* cheerful one week, pathologically depressed the next Occasionally this tendency takes an extreme form and a patient suffers from alternate attacks of severe depression and mania for which no organic cause can be found but which may be sufficiently severe to demand medical treatment and sometimes physical restraint This condition which is relatively rare, is known as the **Manic Depressive Psychosis**

Most patients who suffer from endogenous depression recover completely between their attacks Some however as already pointed out, lapse gradually into **Chronic Melancholia** In other patients this condition is the result of chronic schizophrenia or it may come on insidiously in adult life linking up with the depression of the menopause (page 241) and with the involutional melancholia referred to under the inevitable ageing process It is these patients with chronic melancholia (the pathogenesis of which may be difficult to assess) who so often develop delusions, sometimes of unworthiness guilt or some awful sin committed, sometimes of a physical kind They may live convinced that their bowels are obstructed or in the

belief that their breath or sweat stinks rendering them offensive to other people Some live in a state of continuous ' agitated melancholia "

Other people seem predisposed, presumably through the machinery of the brain which they have got (it is impossible to conceive of genetic predisposition in any other way), not to any form of emotional breakdown, but to under development in a certain direction, just as a mathematical prodigy or a musical genius has an over developed mind in a certain direction In consequence they develop strange delusions and become eccentric in their conduct and behaviour, this condition being known as **Hebephrenia,** but their emotional reactions are normal and their personality disintegrates little with the result that their conduct is normal *granting their delusion* So, unless that takes a dangerous turn, there is no necessity to keep them under restraint For example, Betsy Trotwood in Dickens s *David Copperfield* could keep the bland ingenuous Mr Dick perfectly safely, although he himself could not keep King Charles s head out of his Memorial (He was forever tearing it up and starting it again) In this class are all the harmless, often picturesque and sometimes inevitably amusing lunatics who live in imaginary glass houses, are acted on by wireless waves, wear strange clothes, or keep transmitting sets inside their bodies

Most ordinary people soon find out that they are limited by their natural ability, the circumstances of their lives or the commitments which they have undertaken But common sense teaches them to make the best of it Not so the ambitious and jealous They live striving to obtain the unobtainable nursing grievances, and resenting the assumption of power and authority by others They would have all the power and best positions for themselves, and, unable to realize their own limitations and incapable of adapting themselves to failure tend to lead resentful, discontented lives People like this are always difficult to handle and are sometimes dangerous For a man of this type, thwarted in his particular ambition, may become quite unreasonable and unjustifiably suspicious of those who appear to stand in his way He is then said to be suffering from **Paranoia** He may even come to think that they have got a down" on all he tries to do In consequence the conviction of

persecution by one man in particular, or a group of people, may grow in his mind until it reaches the full stature of a delusion which now starts to dominate his conduct and behaviour, rendering him a real menace to society Many people are paranoid, and a schizophrenic may develop paranoid symptoms but pure paranoia justifying physical restraint in a mental hospital is a very rare condition

UNEXPLAINED DISORDERS OF PHYSICAL FUNCTION

Sometimes some function of the body rather than the mind starts to fail for no apparent reason If this happens in child hood, development is often halted if in adult life, body and mind regress In either case appearance alters or the body starts to behave in some odd way

Failure of Endocrine Secretion

Sometimes the secretion of the thyroid gland fails in infancy The child looks normal at birth but unless thyroid feeding is quickly started (time lost can never be regained), all aspects of development are arrested leading to **Cretinism** Basal meta bolic rate is low, its temperature therefore sub normal and its pulse slow The bones fail to grow and their ossification is delayed so that they bend under the weight of its body Dentition is also delayed and the nutrition of the skin suffers The mind fails to develop (amentia) and sexual maturity is never reached (infantilism) So the cretin (few untreated live to reach adult life) is a stunted deformed imbecile with imperfect develop ment of secondary sexual characteristics and coarse hair pasty face, broad flat nose wide nostrils large fissured tongue, protruberant abdomen (often with an umbilical hernia) curved spine bow legs and deformed inverted feet Such is the extent to which Man is dependent on his thyroid gland

Cretinism tends to occur where the calcium content of water is high and that of iodine low, i e in goitrous districts Sometimes a cretin has an enlarged thyroid gland More often it is atrophied or appears to be absent But it is always difficult to be certain to what extent cretinism is truly a congenital condition The infant *in utero* can probably make do on the thyroxine reaching it from its mother On the other hand, in goitrous

districts it often has a **Simple Goitre,** i e an enlargement of the thyroid gland due to distension of its vesicles with colloid with out either hypo or hyper thyroidism So deficiency of iodine may be the cause both of endemic cretinism in the child and of endemic goitre *in its mother The pathogenesis of sporadic* cretinism is mysterious So also is that of sporadic simple goitre, found occasionally in a healthy adult living in a perfectly healthy ' district Simple goitre, both endemic and sporadic, is much more common in women than in men

Sometimes the acidophil cells in the anterior lobe of the pituitary fail from an early age to secrete enough of the growth factor on which (in addition to thyroxine) the elongation of bone depends This condition the converse of acromegaly, leads to another variety of dwarfism, i e stunted growth in relation to age, namely **Pituitary Dwarfism,** which presents very different clinical features The skin is clear and the features fine and the mind develops normally Further the ratio of body to limb length is normal and not increased as in achondroplasia The pituitary dwarf is a miniature normal person On the other hand, as hormones secreted by the anterior lobe of the pituitary are responsible for initiating and maintaining the functional activity of the gonads, many pituitary dwarfs remain infantile or sexual development in them is delayed (Whence, as might be expected, it is doubtful whether their minds ever develop to the full) But there are all degrees of pituitary dwarfism due to functional differences in the secretion of the growth factor in childhood and adolescence determining whether individuals develop tall or short

Deficient secretion of the growth factor by the anterior lobe of the pituitary is also sometimes associated with atrophy of the hypothalamus Hence, as the latter is concerned with sugar tolerance, **Dystrophia Adiposo-genitalis** (Frohlich s syn drome), characterized by the association of adiposity (mainly of the trunk) infantilism and small stature It is much less common, however, than was supposed at one time and, although pituitary obesity does exist, the fat boy (who is put in goal at football because he cannot run about the field) is usually of normal height and merely the product of delayed puberty, constitutional obesity and over eating

The testicles descend into the scrotum after birth and start

to function at puberty If they fail to descend, they do not start to function So bilateral **Undescended Testicle** is a cause of eunuchism, one variety of infantilism, in spite of the fact that the secretion of the anterior lobe of the pituitary is normal These patients are not dwarfs Rather, their growth in stature is excessive due to the fact that the secretion of the growth factor by the pituitary is unchecked by testicular secretion (This is an example of the feed back mechanism) Further this excessive growth in stature is characterized by a diminished body limb length ratio, the exact opposite to the growth defect in achondroplasia Arms and legs are long out of all proportion to the body

There are many other causes of **Eunuchism** besides un descended testicle It may be due to other diseases of the testicle for example, trauma mumps or ascending infection from the urethra, or to something antagonizing testosterone for example, the administration of oestrogens But it also occurs occasionally, like cretinism and pituitary dwarfism for no apparent reason A similar condition occurs in women Some times the ovaries fail to start to function **Ovarian Agenesis,** in spite of normal pituitary secretion

More often a child has developed into a normal adult before endocrine function starts to fail The commonest failure of this kind is that of secretion of thyroxine by the thyroid gland as in cretinism, giving rise occasionally to juvenile and far more often to adult **Myxoedema,** as this condition of a person is called Occasionally it is secondary to primary failure of the anterior lobe of the pituitary to secrete the thyrotropic hormone Then it usually follows child birth being due to **Post partum Pituitary Necrosis** For during pregnancy the pituitary gland becomes vascular and the sudden fall in blood pressure and circulation rate when the child is born predisposes to thrombosis in it In these cases the symptoms of myxoedema develop and the sexual cycle ceases simultaneously There may also be other symptoms of failure of pituitary function

Far more often myxoedema is due to primary failure of the thyroid gland In an adult some organic cause is occasionally found to account for it The patient may be suffering from primary carcinoma, although this rarely destroys thyroid tissue sufficiently to lead to it Sometimes he has a simple goitre or

districts it often has a **Simple Goitre,** i e an enlargement of the thyroid gland due to distension of its vesicles with colloid with out either hypo or hyper thyroidism So deficiency of iodine may be the cause both of endemic cretinism in the child and of endemic goitre in its mother The pathogenesis of sporadic cretinism is mysterious So also is that of sporadic simple goitre, found occasionally in a healthy adult living in a perfectly 'healthy district Simple goitre, both endemic and sporadic, is much more common in women than in men

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Deficient secretion of the growth factor by the anterior lobe of the pituitary is also sometimes associated with atrophy of the hypothalamus Hence, as the latter is concerned with sugar tolerance, **Dystrophia Adiposo genitalis** (Frohlich's syn drome), characterized by the association of adiposity (mainly of the trunk), infantilism and small stature It is much less common, however, than was supposed at one time and, although pituitary obesity does exist, the fat boy (who is put in goal at football because he cannot run about the field) is usually of normal height and merely the product of delayed puberty, constitutional obesity and over eating

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The skin becomes darker, due to deposition of melanin in areas normally pigmented or exposed to light or friction, and patches of pigmentation appear under the mucous membrane of the mouth Excess of sodium is lost in the urine leading to fall of blood pressure and peripheral circulatory failure The sexual cycle ceases in women and men become impotent Untreated the condition is fairly quickly fatal

Sometimes the posterior lobe of the pituitary fails to secrete enough of the antidiuretic factor to reabsorb the right quantity of water from the glomerular filtrate in the tubules Under these circumstances the patient starts to pass large quantities of pale urine of low specific gravity complains of intense thirst and become rapidly dehydrated This condition, **Diabetes Insipidus,** may be secondary to organic disease The gland has been damaged by fracture of the base of the skull, caught up in some inflammatory condition such as virus encephalitis, tuberculous meningitis or meningo vascular syphilis had its blood supply cut off by some vascular accident or become the seat of primary or secondary new growth In most cases, however no pathological process can be found to explain it

Failure of Carbohydrate Metabolism

Failure to use glucose derived from carbohydrate and the metabolism of protein with the result that it starts to accumulate in the blood (hyperglycaemia), and then when its renal threshold has been exceeded to be excreted by the kidneys in high concentration in the urine **Diabetes Mellitus,** is a common condition Sometimes it starts quite suddenly The patient becomes more hungry than usual because his body is being starved and starts losing weight in spite of a large appetite He also becomes unduly thirsty because his kidneys cannot excrete sugar without water, and he starts passing large quantities of urine containing a high concentration of it He often complains of being compelled to get up frequently during the night Further when the oxidation of glucose falls sufficiently low the utilization of fat begins to fail leading to accumulation of the ketone bodies **Ketosis,** namely acetone, excreted to some extent in the expired air and β hydroxybutyric and diacetic acids excreted in the urine These substances besides causing clinical acidosis are toxic to the nervous system, and in high

Hashimoto's disease But these conditions are rare and in the vast majority of cases the thyroid gland cannot be felt and its function has started to fail for no apparent reason Women are more often affected than men, most often near the meno pause The basal metabolic rate falls, as evidenced by slow pulse, low body temperature and "always feeling cold, ' while infiltration with a mucoid substance leads to dry skin, falling out of hair and thickening of the legs Weight increases and the level of cholesterol rises in the blood In women, after initial menorrhagia (distinguishing primary thyroid failure from that secondary to failure of pituitary function), the sexual cycle ceases Men become impotent The face becomes large and pale, partly due to changes in the skin, partly due to anaemia, usually of the simple hypochromic type Bags develop under the eyes and the outer thirds of the eyebrows become thin, the hair dry, scanty and lustreless, the whole body gross and heavy, the mind dull, lethargic, unresponsive, apathetic And yet, as body and mind *had* developed properly, thyroid feeding will reverse these changes and an almost complete cure can be achieved

Hypoparathyroidism is much less common Further, unlike hypothyroidism, it is usually due to known causes, for example, removal of the parathyroids at a thyroidectomy or carcinoma, but the parathyroid glands sometimes atrophy and their secretion declines for no apparent reason The concentration of ionized calcium in the blood now falls So hypoparathyroid ism presents with tetany, which can also be due, it must be remembered, to any factors which reduce the concentration of ionized calcium in the blood and therefore to alkalosis, rickets, osteomalacia, chronic renal disease and steatorrhoea

Sometimes usually in adult life, the adrenal cortex starts to fail to maintain an adequate concentration in the blood of its hormones on which retention of sodium by the kidneys and the maintenance of sexual function both in part depend It may have been destroyed on both sides by chronic tuberculous infec tion More often it has just atrophied and its function declined The clinical picture produced that of **Hypocorticalism** or **Adrenocortical Failure,** first described and associated with the adrenal glands by Addison and often known as Addison s disease, is the same whatever its ' pathology '

skin and both conditions, by increasing insulin requirement, are common precipitating causes of coma In later life diabetes tends to run a chronic course and is associated with rise of the level of cholesterol in the blood predisposing to atheroma and gangrene and probably to cardiac infarction and cataract A rarer complication in chronic cases is **Diabetic Nephrosclerosis** which runs much the same clinical course as chronic type 1 nephritis Rarer still and complications which seem to bear little relationship to the severity of the disease, are **Diabetic Retinitis,** which may interfere with vision, and **Diabetic Neuritis,** associated with failure of function of the peripheral nerves

Constitutional Obesity

Most people eat more than is necessary to maintain the temperature and structure of their bodies and provide them with the energy which their work demands What happens therefore, to food surplus in this sense seeing that in health digestion absorption and metabolism never fail? Individual practice varies but there are two extreme types some people oxidize it immediately to carbon dioxide and water, others convert it into and lay it down as fat The former can over eat with impunity and are incapable of getting fat or being fattened True that their basal metabolic rate is normal, but their average metabolic rate must be high and they are often unusually energetic The latter put on weight on the least provocation Again their basal metabolic rate is normal but their average metabolic rate must be low and they are usually relatively lethargic although often of cheerful disposition Let me have men about me that are fat are the words which Shakespeare put into the mouth of Julius Caesar who distrusted the lean and hungry Cassius

Why such wide differences should exist between people in this respect (the metabolic behaviour of the body being on the whole so standard) and why there should be some correlation between obesity and temperament are far from clear Studies of families suggest that a tendency to obesity is often inherited Therefore although getting fat *can* be due to over eating in relation to exercise taken true constitutional obesity is almost certainly an inborn metabolic tendency the mirror image of

concentration lead to **Diabetic Coma** *which is characterized by* unconsciousness, a smell of acetone in the breath, sugar and ketone bodies in the urine and slow sighing respiration

The cause of diabetes is not fully understood There seem to be two factors, at least, in its pathogenesis, hereditary tendency and over nutrition A history of diabetes in one or more blood relations is much commoner in diabetics than in non diabetics and the probability of identical twins both getting diabetes is five times greater than that of binovular twins both getting it On the other hand, eighty per cent of patients developing diabetes over the age of forty are or have been overweight, and during both World Wars the incidence of it and deaths from it fell with the introduction of rationing So, while diabetes is sometimes purely genetic, particularly when it starts in early life, most cases are probably due to interaction between genetic predisposition and individual habit

Nor is the functional pathology of diabetes understood It cannot be due merely to failure of the islet tissue of the pancreas to secrete enough insulin to meet the metabolic needs of the body In the first place, there are seldom any visible changes in it In the second, while after complete pancreatectomy for carcinoma 40 to 60 units of insulin will keep the patient sugar free, in diabetes 100 units or more are often required Rather, it must be due to imbalance between the factors which keep the blood sugar up namely, glycogenolysis in the liver and decreased utilization in the tissues, and those which keep it down, namely, glycogenesis in the liver and increased utiliza tion in the tissues Now these factors are under endocrine control Insulin tends to lower blood sugar The secretions of the pituitary and suprarenal cortex tend to raise it glycosuria occurring in hypercorticalism (Cushing s syndrome) and in over action of the anterior lobe of the pituitary (acromegaly) So the functional pathology of diabetes is probably some complex alteration in the pattern of endocrine secretion of the body as a whole rather than simple pancreatic failure

In early life diabetes tends to run an acute course and, before insulin was discovered all cases died in coma (With insulin any diabetic has a reasonable expectation of a normal span of life) Further all diabetics are peculiarly liable both to tuberculous infection of their lungs and to staphylococcal infection of their

be due to primary failure of one of those functions on which the maintenance of the blood depends These primary anaemias are of three clinical varieties corresponding to the mechanism of their pathogenesis

Sometimes anaemia appears to be due to failure of the gut to absorb iron (quite apart from its failure to absorb fat as in steatorrhoea) and/or convert it into haemoglobin in the bone marrow Under these circumstances the red blood corpuscles are small and pale, while for some reason the nails become brittle, flat and often spoon shaped (koilonychia) Some patients, usually women, have difficulty in swallowing (dysphagia) due to dysfunction of the upper end of the oesophagus the so called Plummer Vinson syndrome Anaemia of this type, **Idiopathic Hypochromic Anaemia,** may occur at any age and in either sex but is commonest in women before the menopause on account of the fact that the monthly loss of blood in them like any other cause of chronic haemorrhage, tends to aggravate any tendency in this direction But it must *never* be diagnosed unless it is absolutely certain that the patient is getting *enough* iron and that it is *not* entirely due to haemorrhage After a few years it may remit spontaneously In the meanwhile he or she can usually be kept in health by maintaining a high concentration of iron in the gut

Less frequently and rarely under the age of forty anaemia proves to be due to atrophy of the mucous membrane of the stomach and the absence from the gastric juice of the intrinsic factor on which the absorption of cyanocobalamin (vitamin B_{12}) depends For this substance is necessary to the normal formation of red cells in the bone marrow which in its absence undergoes megaloblastic change In **Pernicious Anaemia,** therefore, as this condition was called to distinguish it from the anaemias easily cured with iron the production of corpuscles falls off and those formed are stuffed with haemoglobin giving rise to a blood picture of the macrocytic hyperchromic (high colour index) type often characterized by megaloblasts and nucleated red cells in the circulating blood Further the red cells formed under these conditions are destroyed over quickly Hence the slightly enlarged spleen and the slight increase in the concentration of bile pigment in the blood and tissues, giving the patient a lemon yellow look In addition

inborn lightness of build, all intermediate degrees between these two extremes existing It tends to make itself felt, particularly in women, at those periods of life associated with readjustment of the pattern of endocrine secretion in the body Many girls get fat just before, and start to lose weight after, puberty, while a woman may start to put on weight at the menopause, or a fat one lose it food intake and exercise taken remaining unchanged But there is no evidence to warrant the idea that constitutional obesity is due to any specific endocrine disorder And it is certainly not due to any organic cause The distribution of the fat is essentially physiological It is not limited to the body, as in hypercorticalism, or gathered together in lumps, as in lipomatosis (benign neoplasia) and **Adiposis Dolorosa** (Dercum s disease) Further it reacts to radical restriction of diet, which organic obesity does not In the latter the patient loses weight as a whole but his deposits of surplus fat persist

On theoretical grounds increase in weight must throw a greater strain on all the joints that carry it and impose more work on the heart Up to a certain point clinical experience bears out this expectation Obese people are more liable to osteo arthritis of hip and knee, and more liable to benign hypertension, heart failure and gall stones than the thin On the other hand, the thin do get these diseases and the fat do not get them invariably So all that can be said is that obesity *may* be a factor in the pathogenesis of these conditions, and it is certainly a factor in the pathogenesis of diabetes Vital statistics also suggest that the expectation of life of the fat is less than that of the thin So the constitutionally obese person is wise to take *active steps to keep his weight within reasonable limits*

The Primary Anaemias

Anaemia, which in an acute case must be defined as a decrease in the total haemoglobin content of the body and only in a chronic case when the blood volume is normal, can be defined as a reduction of the percentage of it in the blood, is a common consequence of many pathological processes It is inevitable when any condition leads to a degree of bleeding or to a rate of blood destruction for which the bone marrow cannot compensate, or interferes with red blood cell production in it It may also be due to lack of iron in the diet But it may

quite common in young people in whom they are associated often with physical unfitness and over smoking They tend to occur at rest, when the heart is beating slowly and to disappear when it quickens with exertion They usually occur quite irregularly although some people maintain an ectopic beat at regular intervals throughout their lives

The heart must quicken in exercise, fever thyrotoxicosis anaemia peripheral circulatory failure and organic heart disease and in anxiety states its rate of beating may be out of all proportion to the needs of the body Under all these conditions the tachycardia is simple that is to say the impulses to which the heart is responding are arising in the sino auricular node as evidenced by the normal shape and position of the P wave in an electrocardiogram (The beating of the heart remains under autonomic control) Sometimes an electrocardiogram reveals that they are originating in an ectopic focus in either auricle or ventricle like a single extra systole Tachycardia of this kind which is nothing more nor less than a succession of extra systoles, is said to be paroxysmal or ectopic and is usually truly paroxysmal in the sense that it occurs in short attacks Nevertheless the use of the word paroxysmal is unfortunate because **Paroxysmal Tachycardia,** as thus defined particularly when it is due to organic disease sometimes lasts indefinitely Normal rhythm never returns

The commonest variety of attacks of this kind is **Auricular Tachycardia** It tends to occur in adolescence and middle life and to become less frequent with advancing age Sometimes a paroxysm lasts as long as two or three days The rate of beating varies between 150 and 220 and the ventricles keep in step with the auricles There is no AV block In **Auricular Flutter** impulses originate from some ectopic focus so fast, up to 360 per minute that the ventricles cannot keep pace *and under these circumstances varying degrees of block lead* to regular irregularity of the radial pulse Further auricular flutter is usually associated with either myocardial ischaemia or chronic rheumatic carditis although it may occur independently of any known organic disease In **Paroxysmal Auricular Fibrillation** stimuli arise rapidly in many parts of the auricular muscle and out of all relation to each other with the result that the auricle ceases to contract as a whole and

he is liable to degenerative changes in his lateral and posterior columns, **Subacute Combined Degeneration** of his spinal cord Advancing age is one factor in the pathogenesis of this type of anaemia but there is almost certainly a genetic factor in it too A patient with it has some blood relation who has had it more often than can be attributed to chance, and it is a disease of the white races and more common in women than in men It may be, therefore, that a predisposition to atrophy of the gastric mucous membrane is inherited and that the disease is brought on as age advances by any factors tending to affect it adversely

Still less frequently anaemia may be due to aplasia of the bone marrow, all three elements of which may be affected, namely the erythropoietic tissue, the leucopoietic tissue and the megakaryocytes Under these circumstances the red cell count and haemoglobin percentage fall together, so that the colour index remains nearly normal, the granular cell count decreases, so that the proportion of lymphocytes increases, and platelets may completely disappear so that the patient develops purpura This condition, **Aplastic Anaemia,** is known to be caused by certain chemical poisons, and sometimes by substances innocuous to the ordinary person but to which the individual happens to be sensitive It can also be caused by over exposure to ionizing radiation Sometimes it occurs for no apparent reason Hence its inclusion in this section

Disorders of Cardiac Rhythm

Every now and again the normal regular rhythm of the heart is interrupted for no apparent reason by a premature beat or **Extra Systole** of which the patient may or may not be aware (Sometimes he gets the feeling of his heart jumping up into his throat) The next normal beat usually falls in the refractory period of the premature beat and is missed (it is sometimes of the consequent prolonged pause following an extra systole that he is subjectively aware) with the result that the overall rate of beating of his heart is *unchanged over the* period in question These beats, as electrocardiographic examination reveals, originate in some ectopic focus in his heart muscle and may be auricular, nodal or ventricular in origin Sometimes they are due to organic disease of the myocardium More often they seem to occur for no apparent reason They are

reflected in the patient s electro encephalogram, or to sudden alterations in its blood supply Their cause is not yet understood

In epilepsy some metabolic disturbance causes sudden discharge of impulses from a centre in the brain leading to an attack or seizure with or without loss of consciousness Some times it is secondary to and symptomatic of organic disease For example, it may be due to the action of drugs or the result of a cerebral tumour or cerebral arteriosclerosis More often it supervenes for no apparent reason Epilepsy of this kind **Idiopathic Epilepsy,** is almost certainly genetic in origin A family history can be obtained in a high proportion of cases and the electro encephalogram of one or both parents is often to some extent abnormal Further if one identical twin has fits the other usually has them too the abnormality of the electro encephalogram being of the same kind in both Attacks seldom start before puberty or early adult life although almost always before the age of twenty five Epilepsy starting later is usually symptomatic of organic disease of the brain

The manifestations of this strange diathesis are exceedingly varied Sometimes the stream of consciousness is repeatedly and briefly interrupted **Minor Epilepsy or Petit Mal** The patient suddenly stops what he is doing looks dazed for a moment and then carries on This variety is particularly common in children but there is no absolute dividing line between it and **Major Epilepsy or Grand Mal** In this variant, with or without some brief sensory aura an odd smell, a peculiar taste some visual symptom noises in the head or tingling spreading up from the periphery the patient abruptly falls to the ground uncon scious often with a characteristic cry and may hurt himself in falling Sometimes he lies dead still More often, presumably depending on the particular area of the cortex responsible for the attack, convulsions supervene At first his arms are rigid in flexion and his legs in extension due to cessation of pyramidal control on account of which he may pass urine, while his jaw is clenched, with the result that he may bite his tongue, and swallowing is impossible with the result that he froths at the mouth His head and eyes are also characteristically deviated to right or left But this the tonic phase of the fit lasts only a little while In about a minute or less arms and legs begin to jerk rhythmically the clonic phase and these movements

the ventricles respond to as many auricular stimuli as they can manage, their action becoming fast and completely irregular in consequence This condition is also almost always due to some organic cause, either ischaemic, rheumatic or thyrotoxic heart disease, and, once it starts, tends to persist Normal sino auricular rhythm seldom returns spontaneously Recurrent auricular fibrillation, for which no organic cause can be found is however an *occasional* cause of paroxysmal tachycardia Paroxysmal **Ventricular Tachycardia** is almost invariably due to organic disease of the myocardium **Ventricular Fibrillation** leads to immediate failure of cardiac output and is one of the causes of sudden death

Whenever the heart beats too fast for any of these reasons, there is too little time for the ventricles to fill between the beats and the output of the heart tends to decrease The blood pressure sometimes falls and the patient, often conscious of the rapid action of his heart, feels faint Sometimes under these circumstances the ventricles begin to fail to cope with the venous return Then he complains of shortness of breath and, if the tachycardia persists, may develop the signs and symptoms of congestive heart failure which remit as soon as the paroxysm comes to an end But the normal myocardium can usually stand up to tachycardia and congestive cardiac failure seldom supervenes unless the heart is organically diseased

Sometimes the heart beats too slowly Beats may be missed, **Partial Heart Block,** due to depression of the conductivity of the AV bundle, or the bundle may be completely blocked Then the ventricle stops beating or lapses into its own natural rate of thirty to forty a minute, **Complete Heart Block** Under these circumstances attacks of syncope may occur sometimes associated with epileptiform convulsions, the **Stokes-Adams Syndrome** It is always due to organic causes, drugs, toxins or rheumatic or ischaemic disease Some people have con sistently low pulse rates, sinus bradycardia, a primary func tional disorder This may create a diagnostic problem but they never complain of clinical symptoms on that account

Paroxysmal Disturbances of the Nervous System

The brain is liable to certain peculiar disturbances of function due to either sudden metabolic changes sometimes

limp so that the patient slumps to the ground an inert speech less mass without any impairment of consciousness Attacks are precipitated by emotion and males are affected more often than females It usually starts during adolescence or early adult life Nothing is known about either its cause or its functional pathology

Many people particularly highly strung intelligent people, *are liable to recurrent attacks of severe unilateral headache* known as **Migraine,** probably due to some sudden disturbance of their cerebral circulation It usually starts in early adult life and tends to fade out in old age the sexes being equally affected Women are particularly liable to attacks at their periods The patient having often felt pathologically well on the previous day wakes up with a severe headache or the attack comes on later preceded by visual symptoms for example hemianopia corresponding to the side of the subsequent headache or fortification patterns During the attack, which usually lasts about twelve hours, he or she is prostrated until as often happens, it culminates in vomiting The next day the secretion of urine is often increased suggesting involvement of the *posterior lobe of the pituitary*

Stone Formation

Stones tend to form in many places in the body Calcium salts are deposited in tuberculous foci and thrombosis in veins may lead to phleboliths Stones of this kind never lead to symptoms *per se* The stones that matter are those that some times form in the ducts of some of the important organs of excretion and external secretion, occasionally in the salivary glands commonly in the liver and kidneys and sometimes in the pancreas

Gall stones **Cholelithiasis,** are common and in many people cause no symptoms during life (They are found *post mortem* in *twenty per cent of all women and in seven per cent* of all men dying after the age of twenty five) Pure pigment stones made of bilirubin, occur in familial acholuric jaundice in which the concentration of bilirubin in the bile must often exceed its saturation point Stones of this kind are a logical complication of this condition but the pathogenesis of pure cholesterol and mixed cholesterol pigment stones in apparently

gradually grow less and less violent as the fit fades quietly away Then he slowly recovers consciousness, often with a headache, but remains, except for what he is now told, completely ignorant of what happened Sometimes, however, instead of returning to normal conscious life more or less immediately, he wanders off having completely lost his memory, the **Epileptic Fugue,** and gets apprehended by the police Some times an attack never gets further than the sensory aura, **Sensory Epilepsy** The paroxysmal disturbance of function must then have been in a different group of cells in the cortex than in epilepsy associated with motor manifestations But all possible combinations of epileptic manifestations can occur although the pattern of the attack is always the same in any one person Attacks often occur during sleep, and so sometimes pass unnoticed, and an epileptic woman is particularly liable to attacks before her periods On the other hand, epilepsy tends to disappear when she becomes pregnant

These are the common manifestations of the epilepsy but sometimes the normal stream of consciousness is only interrupted in the sense that the mind suddenly switches off on to a com pletely different line of thought and action For example, a man may be walking along the street or engaged at his ordinary work when he suddenly stops takes out his pocket book, goes through its contents, puts it back, and then goes on without ever having known that he did it This kind of thing, **Psycho motor Epilepsy,** may happen again and again, and some times an impulsive unpremeditated act may be performed, pos sibly of a violent nature (If a criminal act can be proved epi leptic, then the man who committed it is innocent in Law) Further, epilepsy is frequently associated with an impulsive psychopathic type of personality and in some cases the mind deteriorates progressively The prognosis in the individual case is so variable, however, that no general rules can be laid down It largely depends on how the individual reacts to symptomatic treatment

Occasionally a patient keeps falling into a state of natural sleep **Narcolepsy,** but, as nothing is really known about the physiology of normal sleep, we remain at a complete loss to explain this odd phenomenon A still rarer condition is **Cata plexy,** in which all the muscles of the body suddenly become

stone is announced, not by acute infection, but by an attack of **Biliary Colic.** A small stone has started to travel down the cystic duct leading to spasm and recurrent attacks of acute pain If it reaches the common bile duct, and gets stuck there (it may pass on and out into the duodenum), it leads to obstructive jaundice and pale or putty like stools, the concentration of bile pigment rising in the blood leading to yellowness of the whites of the eyes and then to yellow discoloration of the skin Mean while *the kidney endeavours to excrete it with the result that* the urine turns dark (This may be the first thing that the patient notices wrong) Before long the duct dilates and jaundice remits or starts to fluctuate But a stone stuck in the common bile duct always predisposes to ascending infection and chronic infection of the biliary tract predisposes to **Biliary Cirrhosis** of the liver

There are two other rare complications of cholelithiasis A large stone may ulcerate into the small gut, the gall bladder having become adherent to it, and then, passing down in it, get stuck at the ileo caecal valve, causing intestinal obstruction Or if the mouth of the common duct is obstructed by a stone bile may be forced up the pancreatic duct Under these circum stances the bile may activate pancreatic trypsinogen and lipase, leading to necrosis haemorrhage and suppuration In this condition, **Acute Haemorrhagic Pancreatitis,** the patient is suddenly seized with violent pain in his epigastrium vomiting slight fever and abdominal rigidity

Stones in the kidney, **Nephrolithiasis,** or to be more exact in the renal pelvis or its calyces, are much less common and consist of one or more of those substances habitually or occasionally excreted in the urine namely calcium phosphate and oxalate, uric acid urates and cystine All are sparingly soluble in water and their solubility is influenced by pH When the urine is very acid uric acid and urates tend to crystallize, when alkaline calcium phosphate and carbonate Stones tend to form when the demand for the excretion of any one of these substances is high when water is short so that it is of necessity excreted in high concentration, and when the pH of the urine is such as to lower its solubility For instance, the demand for excretion of oxalic acid is increased after eating rhubarb, of uric acid after an attack of gout of calcium in hyperparathyroidism

healthy people is a more difficult problem One large stone may form or a number of little ones, or the gall bladder may be full of gritty debris In theory two factors predispose to the condition In the first place, infection may provide inflammatory debris on which cholesterol in concentrated solution can crystallize and the gall bladder *is* usually infected in cholelithiasis, although on the whole the evidence suggests that it is stones which predispose to infection rather than infection which predisposes to stones In the second, an excess of cholesterol in the blood might lead to a supersaturated solution of it in the bile and cholesterol *is* produced by the adrenals, by the corpus luteum of each menstrual period and in large quantities by the corpus luteum of pregnancy (Large quantities are ingested in cream and eggs) On the other hand, there is no evidence that the cholesterol content of the blood is higher in people with gall stones than in that of those without them, and post mortem statistics fail to show any correlation between gall stones and parity Yet they are certainly more common in women than men, and more common in the fat than the lean, while the very existence of pure cholesterol stones does seem to point to some abnormality of metabolism as being responsible for them

Stones in the gall bladder predispose to infection, usually by the *B coli* which probably get there via the blood Low grade infection leads to no serious consequences at first but, in due course, as the interaction between stone formation predisposing to infection and infection predisposing to stone formation piles up, the gall bladder gradually becomes fibrosed, contracted and incapable of performing its normal function of storing and concentrating the bile pending the arrival of fat in the duodenum Yet is is doubtful whether **Chronic Cholecystitis** is ever a cause of clinical indigestion although it is rational to recommend a low fat diet in all cases of chronic biliary disease

At any moment chronic may flare up into **Acute Cholecystitis** with pain and fever and tenderness and rigidity in the right upper abdomen An attack of this kind usually settles down but the inflammation may advance rapidly leading to a collection of pus in the gall bladder or even to perforation of its wall and general peritonitis More often the presence of a

Sometimes similar attacks recur, acute merging gradually into chronic gout in which sodium biurate is gradually deposited in the cartilages and capsules of the joints, in nearby tendons and under the skin over the cartilages of the ear, while certain joints become progressively disorganized Gout chronic from the start often presents under the guise of chronic arthritis

Gout is a disease of the white races particularly the English and Germans and of temperate climates It is almost unknown among coloured men and in tropical countries A family history of it can often be obtained and men are affected much more often than women These facts suggest a genetic predis position to get it Pitt got it before he was twenty one But it is rare under forty and there is a definite association between the incidence of it and the dietetic habits of the individual notably excessive consumption of food rich in nucleo protein beer and red wines While gout is uncommon in whisky drinking Scotland it has always been prevalent in beer drinking Germany and was common in England in the eighteenth and early nineteenth century when the consumption of red wines was high Indeed although its exact chemical pathogenesis remains obscure, it is undoubtedly due to genetic predisposition revealed sooner or later depending on its strength and the habits of the individual

Another disorder of metabolism that sometimes comes on in later life concerns that of iron and is known as **Haemochromatosis** or bronzed diabetes An iron containing pigment haemosiderin is slowly deposited in the pancreas leading to fibrosis and a mild degree of glycosuria in the skin leading to generalized pigmentation in the liver leading to hepatomegaly, and in the cortex of the suprarenal gland leading to loss of hair and regression of the secondary sexual characteristics This condition *could* be due to excessive absorption of iron from the gut (haemosiderin is deposited in the skin of patients transfused with blood repeatedly) but it is a disease of adult males only and it seems more likely that it is due to some acquired failure of metabolism A comparable and also rare condition **Hepato-lenticular Degeneration** (Wilson s disease) is due to abnor mal metabolism of copper and here there is some evidence that the defect is of genetic origin It is characterized by a multilobu lar cirrhosis of the liver and degeneration in the lenticular nucleus

and of cystine in the congenital disorder known as cystinuria The pH of the urine varies with the diet, tending to be alkaline on a vegetarian and acid on a meat one Further, infection pre disposes to stone formation and stone formation to infection But again stone formation usually precedes infection and in most cases it is impossible to explain why the patient should have a large calculus, consisting usually of alternate layers of uric acid calcium phosphate and calcium carbonate in one of his kidneys Further, if a calculus starts to form in one kidney, before long a similar one starts to form in the other

The consequences of stones in the kidney are much more serious than those of stone in the gall bladder for the simple reason that the kidney is a more important organ An enlarging calculus destroys renal substance and may lead to haematuria A small one blocks the junction of the pelvis and ureter, leading to hydronephrosis and renal atrophy Further, all calculi pre dispose to infection and pyelonephritis often conspires with the mechanical consequences of a stone to lead to progressive failure of renal functions

Odd Metabolic Disorders

A metabolic disorder, common in this country at one time, is **Gout** The concentration of uric acid suddenly rises steeply in the blood and the patient is woken up by acute pain in the first metatarso phalangeal joint of one great toe which is now red, glazed, swollen and tender Sometimes one of the other small joints of the foot, and occasionally the ankle or the metacarpo phalangeal joint of the thumb or the wrist, is affected His temperature is raised and a blood count reveals a polymor phonuclear leucocytosis An acute attack of this kind lasts a day or two and then subsides During it the overall excretion of uric acid is not increased Further, an excess of uric acid in the blood *per se* does not lead to gout (It is much increased in leukaemia and chronic nephritis) On the other hand, excessive intake of food rich in nucleo protein will precipitate an attack and the rise in concentration of uric acid in the blood before one seems to be due to diminished excretion of it, while cinchophen, which increases the excretion of it, will cut short an attack Therefore although uric acid in the blood is not the cause of gout, the metabolism of nucleo protein is clearly at fault

due either to deficient production of acetylcholine at their motor end plates or to premature destruction of it, or to the antagonization of it by some other substance The muscles which fatigue first are those most in daily use, the eyes in a clerk the larynx in a teacher, and in anyone those of the jaw and facial expression The disease usually starts in early adult life and runs a variable course It may prove fatal but symptomatic relief is often obtained by giving drugs of the physostigmine group (which antagonize acetylcholine esterase) and success has been claimed for thymectomy based on the observation that the thymus gland is enlarged in many cases

Secretory Disorders of the Skin

The function of sweating is to keep body temperature down during exercise and on a hot day by leading to rapid evaporation of water with absorption of heat Sweating is however, under emotional control as well as being physiologically determined and some people sweat excessively apart from emotional stimulation Further this condition **Hyperidrosis,** may be limited to certain parts of the body notably the palms of the hands the axillae and the ano genital region, predisposing to all forms of contact dermatitis and to secondary infection It is an important factor in the pathogenesis of many skin conditions

Excessive excretion of sebum, **Seborrhoea,** leading to a greasy muddy coloured skin, tends to occur round about puberty when it appears to be associated with excessive secretion of androgens (for it can be relieved by giving oestrogens) and is often associated with the eruption known as **Acne Vulgaris,** i e pustule formation due to plugging of the mouths of the sebaceous glands with keratinous material leading to inflammation behind it Hence so called black heads or comedones It is particularly common in young adolescent males in whom it tends to affect the back of the neck and in women with a tendency to vaso motor instability it may lead to an unsightly condition of the face know as **Acne Rosacea** In some people a seborrhoeic tendency persists throughout life It is particularly common in dark people and the coloured races, predisposing to a characteristic skin odour and, like hyperidrosis, to secondary infection

leading to involuntary movement of a curious kind, dysarthria and rigidity of the muscles of the face, neck, and later of the whole body The lenticular nucleus contains an excess of copper and there is increased excretion of it in the urine

Sometimes a lardaceous or waxy substance, a product of protein degeneration linked to chondroitin sulphuric acid, the latter a normal constituent of elastic tissue and cartilage, is deposited round the capillaries and in the walls of the small arteries Clinically there are two types of this condition **Secondary Amyloidosis** occurs in chronic suppuration, particularly secondarily infected bronchiectasis and chronic osteomyelitis, in tertiary syphilis and in tuberculosis of bones and joints It is characterized by hepatomegaly, splenomegaly and heavy albuminuria, the latter due to renal involvement which may lead to renal failure **Primary Amyloidosis** may cause no symptoms during life but it is always a possible explanation of symptomless hepatomegaly (spleen and kidneys are seldom affected), and of cardiomegaly with or without congestive failure which cannot be explained in any other way

Rare Disorders of Neuro muscular Control

Sometimes a patient complains of discomfort in his chest, regurgitation of fluid into the mouth on lying down, or of actual difficulty in swallowing, and on screening the lower third of the oesophagus is seen to be enormously dilated but, when amyl or octyl nitrite is given, the cardia opens and the barium above drops through into a normal stomach This condition, failure of the cardia to relax, **Achalasia of the Cardia,** is comparable to congenital pyloric stenosis in which the pylorus fails to relax But while congenital pyloric stenosis occurs in infancy and mainly in males, achalasia of the cardia occurs in adults and mainly in females So it is regarded as being due to degeneration of the nerve plexus on which the mechanical control of the cardia depends On the other hand, the dilatation of the lower end of the oesophagus is sometimes already so enormous when these patients first start to complain of symptoms as to suggest that some cases are really congenital in origin

Another strange neuro muscular disorder, **Myasthenia Gravis,** characterized by rapid fatigue of voluntary muscles, particularly those innervated by the cranial nerves, must be

All these diseases are diverse in their manifestations, turning up at different stages in many departments of a hospital, and tend to overlap each other clinically in the sense that it is often difficult to say from which one the patient is really suffering For example, is the case one of specific rheumatism or of rheumatoid arthritis? In fact we are probably dealing with the consequences of a number of adverse factors of a *similar* type stimulating the different reactions of *different* constitutions and any attempt to carve up this continuum into diseases 'in splendid isolation (however necessary that may be for descriptive purposes) is artificial and correspondingly unsatisfactory

A number are characterized by proliferation of fibroblasts, excessive deposition of collagen fibres exhibiting hyaline degeneration, increase in the ground substance between cells, and subacute inflammatory infiltration, leading to serious and often permanent structural damage These are known as the **Collagen Diseases,** the disturbance of function depending on the part or system of the body affected The grouping of these conditions (often exceedingly diverse in their clinical manifestations) under this heading is therefore based on the common nature of their morbid anatomy and the justification for adopting it as a basis for classifying them the reasonable assumption that the cause of these changes is likely to be always of the *same* general nature Nevertheless it must be remembered that *different* adverse actions on the body may theoretically at least lead to the *same* structural change in people of *different* constitution

The first of the two important collagen diseases (the first because it tends to start in early life important because it is so common and its long term consequences so devastating) is **Acute Specific Rheumatism** A few days after a streptococcal throat a patient s temperature rises again and he complains of pain in his joints which may be slightly swollen due to effusion of serous fluid But this pain (and the swelling if any) rarely stays put long in any one joint Rather it tends to flit from one to another here one day there the next a knee and elbow on Monday an ankle or the other knee on Tuesday Further a systolic murmur can usually be heard over the apex beat due to functional mitral incompetence (leaking on account of dilatation of the mitral ring as opposed to disease of the valve cusps)

Excessive dryness of the skin, due to diminished secretion of sweat and sebum, is usually due to known causes such as hypothyroidism and dehydration The extreme form, icthyosis, as has been seen already, is a congenital condition

THE HYPERSENSITIVITY DISEASES

As has been seen already, a number of diseases are due to sensitivity (page 95) Either a substance acts as a specific antigen in that person, although not in most people, or, as seems more likely, it acts as antigens in *everybody* but the production of antibody in response to it is deficient in *some* people with the result that when *they* meet it again, the antigen antibody reaction (inactivating the antigen) takes place in their tissues leading to characteristic symptoms These conditions are of a non progressive nature and, if the antigen can be avoided the patient remains free of symptoms Further, although skin tests are positive, demonstrating specific antibody in his system, it cannot be demonstrated in his blood and the gamma globulin fraction of the plasma protein is not increased

A group of diseases due to specific bacterial antigens or to antigens produced *in* the body under certain circumstances such as exposure to cold, stress fatigue malnutrition or infec tion leading to *progressive* structural change and functional disorder, will now be described, although how these lead to it is far from clear as yet Maybe the antibody produced in response to the antigen is also an antigen itself, stimulating the produc tion of yet another antibody which is again an antigen Or certain tissues of the body for some reason begin to act as antigens (Hence the alternative name for *some* of these hyper sensitivity diseases i e auto immunity, or better auto hyper sensitivity, diseases) Specific antibodies to known antigens are found in the blood in some of them In others gamma globulin is raised indicating active antibody formation Further evidence as to this being their probable nature is afforded by the fact that like the sensitivity diseases already described these hypersensitivity diseases react symptomatically to steroid therapy which blocks reactions between antigen and antibody Why some people should become hypersensitive, however, remains altogether unexplained

synovial membranes of the affected joints and of the muscles, throughout the heart, and sometimes in the pleura lung and pericardium

With rest in bed and large doses of salicylate acute rheumatism subsides in a few days or weeks Only cases with severe cardiac involvement and pericarditis are ever fatal The temperature comes down although tachycardia may linger on and it may be weeks before the sedimentation rate returns to normal Usually, too the soft systolic murmur disappears But although salicylates relieve the immediate symptoms dramatically, and are in this sense a specific in the treatment of acute rheumatism it is doubtful if they have any effect whatever in arresting the pathological process in the heart Nevertheless an interlude of apparent good health now follows although in it two things may happen The patient may get one or more attacks of **Subacute Rheumatism** with muscular or joint pain, often precipitated by a slight sore throat Or he may develop **Sydenham's Chorea** (St Vitus s dance) although this disease is now much less common than heretofore The patient still a child or now a teenager and not infrequently after a period of stress (for example being pushed for a scholarship or taking up a too exacting occupation), sometimes rather suddenly after an emotional shock starts persistent non repetitive purposeless movements These are sometimes confined to one side of the body always associated with general muscular weakness and hypotonia, and invariably aggravated by excitement and anyone else s attention Like fidgety Phil the child cannot keep still and may be quite unable to feed or dress himself on this account Its movements may be so violent that it throws itself out of bed Their origin is somewhat mysterious They are said to be due to inflammatory changes of an encephalitic nature in the basal ganglia although the relation of these changes to acute rheumatism is far from clear Two clinical facts outstand however chorea usually occurs in children who have had acute rheumatism when the child gives no history of it examination usually reveals or the patient subsequently develops rheumatic heart disease

Sooner or later most people who have had acute rheumatism in childhood begin to complain of shortness of breath and examination now reveals evidence of valvular lesions clearly

and the pulse rate is often raised out of proportion to the patient s temperature In a few cases pain referred to the shoulder draws attention to **Acute Rheumatic Pericarditis,** which leads to a serous pericardial effusion Occasionally, too, a pleural rub points to rheumatic pleurisy and congestion of a lobe of a lung, usually the lower lobe of the left, particularly in cases of pericarditis, justifying a diagnosis of **Acute Rheumatic Pneumonia** In children rheumatic nodules often appear under the skin of the scalp, down the vertebral borders of the scapulae, behind the elbows and sometimes in other places The sedimentation rate is raised and there is a polymorphonuclear leucocytosis of the blood Nevertheless, in many cases this strange pathological process remains unsuspected until the symptoms of chronic valvular disease announce its presence in early adult life

The relation of acute rheumatism to streptococcal infection remains to be decided Careful search has failed to find streptococci anywhere in joints, muscles or heart, and the view now generally accepted is that most cases are due to hypersensitivity to streptococcal infection of the throat This is confirmed by the frequent finding of streptococcal antibodies in the blood But they cannot *always* be found and some cases may well be due not to infection but (as already suggested in discussing the pathogenesis of the hypersensitivity diseases in general) to antigens produced in the body under stress in fatigue and by exposure to cold Acute rheumatism is a disease of the poor and of temperate climates and rightly to some extent associated in the lay mind with damp and cold its incidence having declined with improved living conditions Sometimes, however, there is a family history of it and some maintain that a certain type of child tends to get it So genetic predisposition may play a part in its pathogenesis

The anatomical lesion is the Aschoff node, a small central necrotic area surrounded by epithelioid cells arranged fan wise and outside this a halo of lymphocytic infiltration These are found mainly in the heart muscle, papillary muscles of the chordae tendinae round the bases of the valves and at their contact margins (The nodules which develop under the skin in children are aggregations of Aschoff nodes) There is also inflammation without any particular structural features in the

incompetence, however, predisposes to left heart failure In aortic stenosis the output from the left ventricle is obstructed The pulse is now small and the systolic blood pressure low while, particularly if the aortic valve is also incompetent, the diastolic pressure is bound to be low as well So patients with aortic stenosis tend to suffer from attacks of syncope (faintness) due to recurrent failure of the left ventricle to effect a sufficient cardiac output to maintain the arterial pressure Again the ventricle develops compensatory hypertrophy but aortic stenosis, like aortic incompetence, also predisposes to left heart failure

Functional **Tricuspid Incompetence,** i e incompetence due to dilatation of the muscular ring on which the valve is built as opposed to organic disease of its component cusps not infrequently occurs in advanced mitral stenosis Only occasionally is it due to chronic rheumatic endocarditis affecting the valve but its consequences are the same whether functional or organic in origin namely pulsation in the veins of the neck and congestion and pulsation of the liver the pressure changes in the right ventricle now being transmitted through into the whole venous system **Tricuspid Stenosis,** which may occur, like mitral stenosis with or without incompetence, leads to a persistently high systemic venous pressure and predisposes to cardiac cirrhosis of the liver and ascites as in constrictive pericarditis (page 121) In these cases ascites due to portal obstruction and hypoproteinaemia precedes oedema due to congestive cardiac failure (*vide infra*)

A normal myocardium by developing hypertrophy can compensate for almost any valvular defect although sooner or later the patient begins to complain of some limitation of the rate of work which he can undertake before breathlessness pulls him up Further in mitral stenosis particularly there may be some congestion of his lungs predisposing to bronchitis and occasional attacks of haemoptysis, and some peripheral cyanosis But as yet there is no serious failure of venous return from either the lungs or the body Eventually however compensation does break down This may be due to myocardial fibrosis and insufficiency the direct although often much delayed consequence of the hypersensitivity process which started in childhood In elderly patients with rheumatic hearts it may be mainly due to age change in their coronary arteries In both

due to **Chronic Rheumatic Endocarditis** Further, when a young adult complains of shortness of breath evidence of chronic rheumatic endocarditis is sometimes found although he gives no history of acute rheumatism or chorea (He must have had it sub clinically) Frequently too, it is found on routine examination of a person, an army recruit, for example, who does not even complain of shortness of breath In these patients the pathological process almost certainly began in childhood Chronic rheumatic endocarditis is the commonest cause of valvular disease of the heart at all ages

In some cases the edges of the two cusps of the mitral valve become fused together and fibrosis in the bases of them converts the valve into a narrow tunnel This condition, **Mitral Stenosis** (the *only* cause of it is chronic rheumatic carditis), obstructs the flow of blood into the left ventricle, and throws more work on the right ventricle, but there is no strain on the left Mitral stenosis predisposes to congestion of the lungs however, although in a chronic case this is less than might have been expected as the pulmonary arterioles tend to constrict, reducing the blood flow into them In other cases fibrosis in the papillary muscles and chordae tendinae, by shortening them, prevents the valve flaps falling back against each other in systole to create a water tight membrane, leading to **Mitral Incompetence** Some blood now regurgitates into the left auricle at each systole and the left ventricle must expel more blood at each beat, and so do more work to maintain the circulation Mitral stenosis is sometimes found without any appreciable incompetence but the mitral valve is usually in competent as well Mitral incompetence without stenosis is uncommon and for some reason usually occurs in men

The aortic valve is much less often affected but fibrotic changes in its cusps may lead to **Aortic Incompetence** and/or **Aortic Stenosis** In the former the systolic output of the left ventricle at each beat is increased to compensate for the inevi table leak back during diastole So the systolic pressure rises while the diastolic falls, i e the pulse pressure is raised, the pulses becoming of large volume collapsing and in an extreme case, water hammer More work is thrown on the left ventricle which time and blood supply permitting develops hypertrophy and thus maintains the circulation Aortic

disease although there is little evidence that it is actually inherited Occasionally it follows some acute infection but there is scant correlation with streptococcal throat, as in its acute specific cousin, and little evidence of association with focal sepsis, as was believed at one time Sometimes it follows a period of stress or emotional strain, occasionally it comes on after pregnancy and it may bear some relationship to damp and exposure to cold but most cases seem to start for no apparent reason Further although it occasionally occurs in childhood, when it is known as **Still's Disease,** on the whole it tends to come on in a later age group than acute rheumatism, usually between the ages of twenty and forty Non specific agglutinins can often be demonstrated in the patient's blood

The onset is usually insidious and associated with general ill health loss of weight anaemia and low grade fever rheumatoid arthritis being essentially a disorder of the whole body and not merely a disease of its joints like osteo arthritis (in spite of its name really a degenerative condition) with which it is often confused and with which in older patients it not infrequently co exists Then after this period of prodromal ill health the patient begins to complain of pain in and to notice swelling of one or more joints Further, the muscles round them become weak Either upper or lower limbs may be affected first but the *disease usually starts in the more peripheral joints and spreads* centrally There is little flitting about as in acute specific rheumatism In the upper limbs the order of joint involvement is inter phalangeal of one or more fingers first metacarpo phalangeal wrist elbow in the lower first metatarso phalangeal (as in gout) ankle, knee But there is no fixed order of events Hip shoulder and spine often escape but the temporo mandibular joint is sometimes involved

The structures round the joints are first affected The skin begins to look glazed and shiny due to atrophy, and the joints stand out as the muscles round them waste Then capsules and synovial membranes become inflamed and now the joints are actually swollen and extravasation of fluid into them may make them swell still further In the meanwhile granulation tissue starts to form in the angles between cartilages and capsules and extending inwards, gradually destroys articular cartilage with the result that the joint space in an X ray disappears, the

decompensation is usually precipitated by the abrupt onset of **Auricular Fibrillation** (page 153) The auricles cease to beat effectively and the ventricles start to beat irregularly and rapidly with the result that there is now too little time for them to fill between beats Their minute output declines and blood is dammed back in the pulmonary and systemic venous systems

Chronic **Congestive Heart Failure,** as this condition is called, can, however, usually be postponed for many years, by controlling the ventricular rate with digitalis But, as the myocardial condition slowly worsens, the heart begins to fail to cope with the venous return to such an extent that the venous pressure rises to the point at which fluid accumulates in the tissue spaces In left heart failure (which in chronic rheumatic endocarditis may be due to aortic stenosis or incompetence or to mitral incompetence) this congestion is of the lungs in the first instance, as evidenced by attacks of shortness of breath and the signs of pulmonary oedema Right heart failure is inevitable however sooner or later, and may also *follow in the wake of primary left heart failure, venous congestion* being now transmitted backwards through the lungs At this point the systemic veins become congested (The jugular veins can be seen standing out in the neck) The liver becomes palpable and tender (nutmeg liver) The secretion of urine, which becomes concentrated and deposits urates, declines Oedema, starting in the feet, spreads slowly up the body and before long fluid accumulates in the peritoneal cavity and often in the pleural cavity on one or both sides Ultimately bronchopneumonia, or sometimes cerebral embolism, rings down the curtain on the clinical scene

The second important collagen disease, **Rheumatoid Arthritis,** stand out, in most cases, in sharp antithesis to acute specific rheumatism For, on the one hand, the heart is not affected and, on the other, it is characteristically associated *with chronic and often irreversible changes in the joints* Acute specific rheumatism cripples the heart, rheumatoid arthritis the joints Yet the distinction is not absolute Intermediate types are met and it is sometimes impossible to fit the patient neatly into either category

Women are affected more often than men in the proportion of about three to one, suggesting a genetic tendency to get the

proceeds to involve those between the articular processes of *the vertebrae and the costo vertebral joints Thirdly, the* ligaments of these joints quickly calcify converting the spine and chest into a single bony piece with the result that in a severe case the patient is bent forward almost at a right angle and is unable to raise his head or even turn it to one side Fourthly the joint changes respond to deep X ray treatment which those in rheumatoid arthritis do not

Every now and then rheumatoid arthritis fails to run the course that clinical experience would expect The patient, who is usually a woman, has a high temperature and sometimes one *of a remitting and relapsing type* She looks *toxic* and there may be a suggestion of a reddish bat s wing patch across her nose extending on to both her cheeks There are effusions into her joints and sometimes into her pleural cavities, sometimes even into her pericardium while albuminuria may point to involvement of her kidneys and jaundice to involvement of her liver Further examination of her blood reveals leucopenia and high plasma protein due to increase of gamma globulin which is known to be associated with active immunity reactions in the body Many of her white cells also contain an excess of a protein in their cytoplasm, the so called L E cells because the patient is now said to be suffering from **Disseminated Lupus Erythematosis** There may be a history that she was treated at some time with colloidal gold until recently used in the treatment of rheumatoid arthritis or with penicillin or sulphona mides for some other condition But whether D L E is actually started by these drugs or the reactions to them are *merely excessive in all these patients still remains uncertain*

The story of its recognition as a clinical entity must be told to explain this strange name Lupus vulgaris (tuberculosis of the skin) had long been recognized occurring almost invariably on the face particularly round the nose and leading to dis figuring destruction of the dermis Then, looking rather like it and with a typical bat s wing distribution across the bridge of *the nose extending out on to both cheeks, but never going on to* destruction of the dermis, another clinical entity was recog nized This was called lupus erythematosis, although it soon became clear that the two lupuses could hardly be patho logically related All they had in common was their somewhat

bones looking crowded together Then, as fluid in the synovial cavities is reabsorbed, and particularly if the joints have been kept immobilized, this granulation tissue is slowly converted into fibrous tissue resulting in fibrous ankylosis Meanwhile the bones near the joints have been decalcifying (often the first X ray sign in rheumatoid arthritis) and ganglion formation in neighbouring tendon sheaths is not uncommon Finally, the stronger muscles pull the weak joints' into characteristic positions in which they now tend to get fixed by permanent shortening of the tendons So, if the disease is neglected, it may lead to permanent flexion of the knees, plantar flexion and inversion of the feet, flexion and supination of the elbows, and flexion at the wrists with the fingers, subluxed at the inter phalangeal joints, curled up into useless balls in the palms of the hands

The course of rheumatoid arthritis is exceedingly variable Some cases run a short acute one with much effusion into joints and with quite high fever, the disease looking very much like acute specific rheumatism except that the heart is not affected and the pain and fever do not respond to salicylates The prognosis is relatively good (some cases of Still's disease behave like this) and little permanent damage is left behind More often rheumatoid arthritis runs a chronic course with exacer bations and spontaneous remissions, the former sometimes precipitated by stress, and it is in these cases that attention to general health, steroid therapy (which permits more vigorous physiotherapy) and careful splinting to prevent deformities can do much to minimize the damage done by the disease by the time it has burnt itself out,' as it usually does in a few years Some cases wander on still longer, and a few go straight ahead, resistant to all forms of treatment, leading to fibrous ankylosis of all the main peripheral joints and sometimes even of the spine and large joints

Pain and stiffness in the back, without peripheral joint involvement, associated with general disturbance of health and a high sedimentation rate, always suggests **Ankylosing Spondylitis** This disease differs from rheumatoid arthritis in four respects Although its age incidence is the same, males are predominantly affected Secondly, the joints affected are different it usually starts in the sacro iliac joints and then

have widened our concept of the former, so they have widened our concept of the latter Heart, lung and kidneys are now known to be often affected and the patient may present with symptoms referable to them rather than with any particular complaint about his skin To call this disease scleroderma in so far as it exists as a clinical entity, is really misleading Rather it is a chronic hypersensitivity disease leading to collagen change which may affect the *whole* body, although for reasons not yet understood it tends to affect different parts of it unequally in different cases But as so often happens, the original name sticks and it is as scleroderma with or without systemic lesions, that the disease will continue to be known

The border line between scleroderma and another hyper sensitivity *and* collagen disease, namely **Dermato myositis,** is also ill defined In this condition patches of inflammatory thickening of the skin are associated with similar changes in certain muscles with corresponding weakness of certain muscle groups These, rather than skin changes dominate the clinical scene Again no specific antibodies can be demonstrated in the patient s blood, although he or she (the sex incidence of the two diseases is equal) sometimes recovers almost completely on steroid therapy

Sometimes a patient complains of tender red nodules on his shins, occasionally extending up on to the front of his thighs, and/or on the extensor aspect of his arms This condition **Erythema Nodosum,** is a manifestation of sensitivity to bacterial antigens and links up sensitivity of the non progressive kind with hypersensitivity leading to chronic structural lesions Sometimes it is clearly due to sensitivity to streptococcal infection of the throat occasionally to the meningococcus in the United States often to coccidioidosis (a fungus infection) Not infrequently it is due to sensitivity to the tubercle bacillus, the patient having an active tuberculous focus in a lung Sometimes he is found to be suffering from sarcoidosis (*vide infra*) The condition usually clears up in a week or so without leaving any permanent change behind but unlike the ordinary sensitivity diseases it is uncommon for a patient to have more than one attack

To understand **Sarcoidosis** it is again necessary to know the steps that led to its recognition Lumps in the skin of a

similar appearance (at first sight) and their tendency to develop on the face Then dermatologists began to realize that lupus erythematosis, instead of always remaining chronic and limited to the face, could flare up into an acute condition involving the whole body as evidenced by red spots, the so called "discoid lesions," all over the skin This condition, not infrequently fatal until cortisone was discovered, naturally became known as *generally disseminated* lupus erythematosis Next came the recognition of L E " cells in the blood and these were now found, not only in disseminated lupus erythematosis *with* skin lesions, but also in atypical cases of rheumatoid arthritis *without* skin lesions, providing a connecting link between and pointing to an underlying pathology' common to both conditions Further, the final proof of this concept of their unity has now been furnished by the clinical recognition of cases combining both joint *and* skin lesions with the characteristic changes in the blood, namely leucopenia, hyper globulinaemia and L E" cells In these, as in all generalized forms of the disease, the prognosis is bad, but cortisone, by inhibiting the hypersensitivity reaction to which the clinical manifestations are due, will usually prolong life

The joints in these arthritic cases of "D L E ' often look somewhat different from those in ordinary cases of rheumatoid arthritis The skin over them is glazed and tied down to the tendons with the result that the fingers are thin, immobile at all the inter phalangeal joints and curled up claw like Indeed, joints of this kind link up D L E ," and it would be fair to say also rheumatoid arthritis, with another disease in all probability due to hypersensitivity, and in respect of its morbid anatomy most certainly a collagen disease, namely **Scleroderma** In this condition the skin may be thickened, owing to deposition of collagen fibres, all over the body but this usually starts in, and often remains more or less limited to, the face, forearms and hands The fingers are fixed at the joints, as in ' D L E , ' while the skin may be so tight and thick over the face that it becomes expressionless, as in Parkinsonism (although for an entirely different reason), and the patient, usually a woman, has difficulty in moving her jaw Further, just as lupus erythematosis was first recognized as a skin condition so was scleroderma But just as pathological research and clinical observation

intussusception), synovial effusions to swelling of the joints (as in serum sickness) and extravasation of blood into the skin to purpura The disease is, however, usually self limiting Nor is it, or are the ones related to it, characterized by hyperglobulinaemia Further, there is a leucocytosis occasionally with many eosinophil cells rather than a leucopenia So the reader may think that it ought to have been described under *idiosyncrasy and sensitivity* and he is right up to a point but it has been deliberately included here because it links up forms of streptococcal sensitivity already fairly well understood with a number of obscure diseases of the arterial system

In a certain proportion of cases of anaphylactoid purpura (about forty per cent) perivascular lesions develop all over the body and, occurring in the kidneys, lead to the same clinical picture as acute type 1 nephritis, although the morbid anatomy of the condition is essentially different Further, these renal lesions resemble those of a disease known clinically as **Polyarteritis Nodosa** in which spreading necrosis occurs in all the arteries males this time being affected three times more often than females, and which may start in a manner indistinguishable from anaphylactoid purpura, looking as if that disease could develop into it It may follow a sore throat or some other infection More often it comes out of the blue in a previously healthy man leading to high fever and considerable leucocytosis, other symptoms depending on the arteries particularly affected Some cases start with albuminuria and hypertension, masquerading as primary renal disease Others present with asthma heart failure or gastro intestinal symptoms A number begin with muscular weakness suggesting acute peripheral neuritis at first sight

Closely related to polyarteritis both clinically and pathologically, is another condition first recognized in the temporal artery and still called **Temporal Arteritis** There it causes pain, but in other parts of the body may lead to pulmonary cardiac renal or gastro intestinal symptoms just like polyarteritis, the only grounds for separating it from polyarteritis being its morbid anatomy Temporal arteritis is characterized by the formation of giant cells but clinically the two diseases may be identical and diagnosis depends on the histology of the arteries involved

granulomatous nature (Boeck s sarcoidosis) had long been seen to occur in young adults over the forehead and on the nose and upper limbs with a tendency to linger on for months or even years Then it was found that they were sometimes associated with enlargement of the lacrymal and salivary glands and of the liver and spleen, due to changes of a similar histological nature, and with deposits in the bones, while an X ray often showed enlargement of the hilar glands with fibrotic change fanning out into both lung fields Finally, mass miniature radio graphy demonstrated that lung changes of this kind were far more common than was clinically supposed and often occurred without sarcoid elsewhere

Sarcoidosis runs a benign course and most lesions resolve completely although their histology is not unlike that of chronic tuberculous inflammation But tubercle bacilli are never found in them and caseation never occurs On the other hand, sarcoidosis, like tuberculosis, is not infrequently discovered in patients presenting with erythema nodosum and some cases of typical sarcoidosis develop active tuberculosis eventually The Mantoux test is far more often negative, however, than it should be on grounds of probability So sarcoidosis is now regarded as a hypersensitivity reaction to tuberculous infection of a kind characterized by anergy rather than allergy although it is not a monopoly of the tubercle bacillus It is known to occur in chronic beryllium poisoning and Leishmaniasis and other cases may be due to other causes No specific antigens are present in the blood Nor is there leucopenia On the other hand the plasma globulin is usually high and injection of an extract of sarcoid lymph gland into the skin often causes a local reaction

In the hypersensitivity and collagen diseases hitherto des cribed the brunt of the reaction falls on the joints on the endocardium on the skin or on the connective tissue in the viscera Sometimes it falls on the arteries A streptococcal throat, as has been seen, may lead to acute rheumatism or to erythema nodosum but it may also precipitate an attack of **Anaphylactoid Purpura*** (Henoch Schoenlein syndrome) In this condition patches of congestion of the mucous membrane of the gut may lead to bleeding (or, occasionally, may start an

* The use of the word anaphylactoid is unfortunate. It has no connexion with anaphylactic shock. Allergic would have been a better term.

Purpura This condition can also be controlled by cortisone and sometimes cured by splenectomy, the spleen again being the organ in which the platelets are destroyed

A number of eruptions are likely to be due to hypersensitivity in that they can be suppressed with cortisone, although it is often difficult to say where sensitivity ends and hypersensitivity begins The skin may be unduly sensitive to injury In **Dermatographia** even a light stroke will raise an urticarial weal and this may account for the persistence of some eruptions Further it is often impossible to find out the nature of the antigen and to know when it ceases to operate Nevertheless certain general patterns of skin hypersensitivity reactions can be recognized clinically

Erythema nodosum has already been quoted as an example of skin sensitivity to acute infection A somewhat similar condition, **Erythema Multiforme,** also sometimes follows streptococcal tonsillitis and is much more liable to persist and to recur than erythema nodosum The lesion in erythema multiforme is a patch of capillary dilatation with an area of central oedema which may form a small vesicle or a bulla between the dermis and epidermis A similar less dramatic although more chronic, eruption is **Dermatitis Herpetiformis** Small bullae appear in groups all over the body surrounded by slight erythema When in old age bullae occur in the mouth eyes and at other muco cutaneous junctions ulceration takes place This is called **Senile Dermatitis Herpetiformis (Pemphigoid)** Occasionally one of these sites only is invaded Thus we have oral pemphigus and ocular pemphigus In **Pemphigus Vulgaris** the mouth and lips are commonly affected but the lesions are widespread over the whole body The bullae lie between the layers of cells forming the epidermis and have little surrounding erythema and are even more likely to break down Secondary infection and loss of tissue fluid is a real danger

Any condition associated with erythema tends to itch In **Prurigo** (flexural or infantile eczema) this symptom predominates The disease is often accompanied by hay fever and asthma confirming its sensitivity nature and usually starts in childhood Oedema and vesicle formation are slight but constant cratching causes the skin to thicken (lichenification) Similar eruptions starting in later life can often be traced to one of many

Polyarteritis nodosa can present as ' polyneuritis," a clinical term used to include failure of function of many peripheral nerves due to any cause (Neuritis must not be taken to imply true inflammation) Further, peripheral nerves may be or become, for reasons not yet understood, hypersensitive like skin, joints, connective tissue and arteries, leading to two recognizable clinical syndromes acute **Toxic or Infective Polyneuritis** in which they are involved throughout their length, motor and sensory functions both being equally affected, and the **Guillain Barre** syndrome in which only their motor roots are involved The former often becomes chronic In the latter the patient, if he does not die from respiratory paralysis, usually recovers completely

Some of the hypersensitivity diseases already described may be due, as has been pointed out, in some cases at any rate, to substances which are actually produced *in* the body, as the result of fatigue stress, exposure to cold and infection, and act as antigens Further, under certain circumstances, possibly for one of the above reasons, it appears that the body can even become hypersensitive to its own cells or protein This is called auto hypersensitivity or auto immunity, the meaning of the word *immunity* having now been stretched to include *disease* due to, as well as the *prevention* of it by antibodies Three diseases fall into this category In **Hashimoto's Disease,** characterized clinically by thyroid enlargement and myxoedema (a rare association), the thyroid takes up iodine (the atrophic gland of ordinary myxoedema does not) but cannot convert it into thyroxin That this failure of function is due to auto hyper sensitivity is suggested by two facts the infiltration of the gland with lymphocytes and a rise of the level of gamma globulin in the blood Every now and then some person for some mysterious reason becomes hypersensitive to his own red blood corpuscles, destroying them too fast, the condition known as **Acquired Haemolytic Anaemia** It seems to be most common in elderly women Cortisone will usually control it by blocking the reaction between antigen and antibody and in some cases removing the spleen, in which most of the haemolysis takes place, will restore physiological order The body may also become hypersensitive to its own platelets with the result that it destroys them too fast, leading to **Thrombocytopenic**

posture, affecting eyes and ankles equally (The mechanism of its pathogenesis is not understood) The output of urine falls a little on account of it and in some cases congestion of the kidneys, by interfering with glomerular filtration leads to serious oliguria and even to anuria Under these circumstances the urea in the blood rises although the kidneys are not failing to concentrate it in the urine (What urine is passed is of normal or rather high specific gravity) The blood pressure also often rises a little due to peripheral vaso constriction, effected, at least so experiments suggest, by pressor substances secreted by the inflamed kidneys which appear to be taking the necessary steps to maintain the glomerular pressure on which the secretion of urine depends

An elderly patient (although elderly people seldom get it) *may die of left heart failure if his blood pressure must rise much* to maintain his glomerular filtration An adult is less likely to die of heart failure but may die on account of acute oedema of his brain which leads to the syndrome known as hyper tensive encephalopathy namely the association in attacks of recurrent severe headache, paroxysmal vomiting and loss of consciousness with epileptiform convulsions Further, in a severe case at any age albumin may escape in such large quantities into the urine that the level in the plasma falls to the point (about two per cent) at which on account of reduction in the osmotic pressure of it oedema is inevitable (Acute nephritis is one cause of the nephrotic syndrome, i e the association of gross albuminuria with low osmotic pressure of the plasma and oedema) At the same time the concentrating power of the kidneys fails with the result that the level of urea again rises in the blood and the patient dies of uraemia in six to eighteen months It is in these cases that epithelial crescent formation is found in the glomeruli (proliferative capsulitis) and that hyaline necrosis of arterioles and capillaries is sometimes seen probably due to areas of intense vaso constriction as in malignant hypertension

About five per cent of all cases of acute nephritis die of one of these three causes but with proper management, namely renal rest and the treatment of any focus of infection, ninety per cent recover completely The blood pressure falls oedema goes and the urine clears First red corpuscles and then albumin

possible sensitizing factors, to contact with certain flowers, wools, *chemicals, dyes and cleaning* agents, to minor infections of the skin, to physical injury, to foods and drugs, and even to a neoplasm developing in the body In appearance the eruption can be predominantly erythematous, erythematous with lichenification, oedematous (urticarial), vesicular (eczematoid), bullous (pemphigoid) or hyperkeratotic (exfoliative dermatitis)

NEPHRITIS

Streptococcal infection of the throat is common and may, as has been seen already, lead to rheumatic carditis, to erythema nodosum, to anaphylactoid purpura, in short to a number of the hypersensitivity diseases Sometimes, too, particularly often in children and young people it is followed, after an interval of a *few* days by **Acute Glomerulo nephritis,** which *also* sometimes occurs with streptococcal infection elsewhere, for example, in the middle ear or the skin (impetigo) It may come on with an ordinary cold or after a burn, when again it may be due to infection It may even occur without any apparent infective cause whatever The urine is sterile in all cases but the kidneys are certainly inflamed, judging by the *post mortem findings in a fatal case Acute nephritis is therefore* probably due to hypersensitivity of the kidney to infection, usually streptococcal and usually of the throat Why one person should react to it in this way while most can tolerate it with impunity is not yet understood

Sometimes acute nephritis is focal Only a few glomeruli are involved and recovery is rapid the only symptom transient *haematuria More often both kidneys are diffusely affected* The patient now complains of slight pain in his back, due to congestion of his kidneys, and red blood corpuscles escape into his urine which looks smoky or frankly red according to their number Plasma protein too leaks out through his glomeruli mainly the albumin (on account of its small mole cule) justifying the use of the term albuminuria rather than proteinuria in these cases (The latter is the right term in infection of the urinary tract) But the symptom most often noticed by the patient is oedema This is characteristically non gravitational in its distribution, i e it is little related to

children when it is often referred to as 'nephrosis, although it is probably the same disease in the sense that it is due to the same cause The first thing that the patient notices is white *puffy swelling of his face and feet due to retention of water in his* tissues For without knowing it and without feeling ill in any particular way, he has been losing plasma albumin in his urine for months with progressive fall in the osmotic pressure of his blood and now the oedema point has been reached as in the nephrotic variety of acute type 1 nephritis Indeed, by the time he thinks of seeking medical advice total plasma protein is usually down to 5 G and albumin to 2 G per cent while the ratio of albumin to globulin is already reversed On the other hand, his tubules are reabsorbing and concentrating urea normally So the specific gravity of his urine, which may boil almost solid *with albumin, is* high and the level of urea in his blood is not raised His blood pressure too is normal (there is no necessity for it to be high perhaps) or only slightly raised, and there are seldom many red corpuscles in his urine to suggest inflammatory congestion and infection of his kidneys

So type 1 and type 2 nephritis present very different clinical pictures in their early stages They are also very different in their morbid anatomy The diseased kidneys of type 2 nephritis, instead of being congested and exhibiting changes characteristic of infection and acute hypertension are large and white (like it is sometimes said the patient s large white face) due to the deposition of a lipoid substance in and round their tubules with comparatively little changes in their glomeruli While there fore, it is generally agreed that acute type 1 nephritis is an inflammatory condition resulting from hypersensitivity to infection *there is no general agreement as to the pathogenesis* of type 2 nephritis Indeed at one time it was thought to be due to some form of fatty degeneration rather than to hyper sensitivity Hence the popularity at that time of the non committal word *nephrosis* as opposed to *nephritis* But there is no absolute dividing line either clinical or pathological between nephritis type 1 and nephritis type 2 and it seems more reason able to regard them as manifestations of the action of the *same* adverse factors (probably of a hypersensitivity nature) to which kidneys may be exposed and to which individuals react differ ently The type classification is the best in our present state

disappear and the patient never has any further renal trouble In the remaining five per cent red blood corpuscles and casts linger on in the urine and albuminuria never completely remits Permanent damage has been done and, as subsequent events show, the condition has become chronic, either on account of persistence of hypersensitivity or due to gradual contraction of scar tissue

The clinical course of this condition, **Chronic Nephritis Type 1** as it is now called to distinguish it from another type of nephritis which will be described later, is very variable In some cases the loss of albumin in the urine is so great that the osmotic pressure of the plasma falls to the oedema point leading *to the nephrotic syndrome (So the signs of chronic type 1* nephritis may be identical with those of type 2, to be described below, although their pathology is essentially different) More often the patient remains free from symptoms for many years, although interstitial fibrosis leads to progressive reduction of renal substances and eventually to a contracted kidney (Why this process is sometimes so slow is far from clear) The blood pressure now starts to rise again, as it rose in the acute attack, *and again presumably for the same reason, namely, to* maintain the blood supply of the kidneys and keep up glomerular filtration At the same time their concentrating power starts to fail on account of destruction of their tubules with the result that the specific gravity of the urine declines and soon becomes fixed at a low figure (At this point oedema often diminishes) Then, as glomerular filtration falls off with destruction of glomeruli, the level of urea begins to rise in the blood and at *this stage haemorrhage and exudation into the* retinae (renal or albuminuric ' retinitis) may start to impair vision The end is now near Most cases die of uraemia, the older ones of heart failure or cerebral haemorrhage due to the pressure that the heart was maintaining in the arteries in an ineffectual endeavour to maintain the blood supply of the hopelessly diseased kidneys and ensure glomerular filtration

Type 2 Nephritis, as this somewhat different clinical condi*tion of a patient is best called* is sub acute or chronic from the start and rarely can any history of infection be obtained On the whole it tends to occur rather later in life, and in women more often than men, but it does *sometimes occur in young*

both kidneys are affected the blood pressure starts to rise *and* renal function to fail, due to progressive destruction of nephrons chronic pyelo nephritis tending to run much the same clinical course as chronic type 1 nephritis although more slowly

When therefore a patient is first seen late in chronic renal disease it may be hard to decide in retrospect the pathological route along which he has been travelling Further the differ ential diagnosis between chronic type 1 nephritis chronic type 2 nephritis and chronic pyelo nephritis is complicated by the existence of benign and malignant hypertension and by the degenerative changes in the arteries to which they, diabetes and advancing age all seem to predispose

HIGH BLOOD PRESSURE

During systole the left ventricle discharges all the blood which it contains into the aorta raising the pressure in the large arteries in the brachial normally to 120 mm of mercury, and stretching their elastic walls During diastole this pressure falls, in the brachial normally to 80 mm as their elastic recoil continues to force the blood on against the resistance of the partially constricted arterioles converting an otherwise inter mittent into a constant flow This difference between systolic and diastolic pressure in the larger arteries in the brachial normally 40 mm, the pulse pressure, largely determines the volume of the peripheral pulses

Sometimes the pulse is full, i e of large volume although not actually bounding, because the pulse pressure is raised as the result of **Systolic Hypertension** only (The diastolic pressure is normal) There are two possible explanations of this condition The patient may be nervous and his heart beating unnecessarily fast and the systolic pressure higher at each beat than is really required to force the blood along in relation to the needs of the moment Or his arteries may be rigid as the result of arteriosclerotic change They stretch less easily than they did Each time the usual quantity of blood is discharged into them, his systolic pressure rises higher than in his younger days

When the diastolic pressure is also raised there can be only

of knowledge and the term "nephrosis" should be studiously avoided

This attitude is justified by the clinical course of chronic type 2 nephritis Complete recovery in adults is more common than was at one time supposed and may occur suddenly after several years of persistent albuminuria and oedema (There is always a much greater chance of it in a child) Nevertheless, most adults do not recover Albuminuria and oedema (partially controllable by a high protein diet and diuretics) persist, and all the while the patient remains peculiarly liable to inter current infection Then, again quite soon in some cases but not for years in others, interstitial fibrosis proceeds to convert the large white kidney of sub acute type 2 nephritis into the contracted small white kidney of chronic type 2 nephritis Again the blood pressure now rises 'in an attempt' to maintain gomerular filtration and, at the same time, the concentrating power of the kidney again declines leading to fixation of the specific gravity of the urine at a low figure Then, as glomerular filtration starts to fail the level of urea rises in the patient s blood and at this point he develops renal retinitis So he, too, may also die slowly of uraemia or heart failure or suddenly of cerebral haemorrhage Thus two apparently different pathological roads, certainly different in terms of structural change, may lead the same way home' In their terminal stages type 1 and type 2 nephritis may be identical clinical conditions

Chronic pyelitis, which is usually due to the *B coli* and associated with chronic or recurrent obstruction of one or both ureters as has been seen already (page 117), tends to lead eventually to ascending infection of one or both kidneys, **Pyelo nephritis,** but as the involvement of the kidneys is often irreg ular, leading to typical scarring, and as the whole kidney is rarely involved, all evidence of nephritis, other than albumin uria, *may* be lacking at the start (Nephritis should always be suspected in pyelitis when the urine has been kept sterile for some time and yet albuminuria persists) When only one kidney is affected the other one develops compensatory hypertrophy and does the work of both but the blood pressure may rise dangerously and to no useful purpose, due to the secretion of pressor substances by the diseased kidney When

so frequently in later adult life, and sometimes at quite an early age, creating the necessity for permanent high blood pressure to maintain the circulatory *status quo* but which, unlike the hypertension of chronic renal disease as far as can be seen serves no useful purpose? In theory it might be due to anxiety For fear acting through the sympathetic nervous system is known to constrict the peripheral arterioles and lead to transient increase of systolic and sometimes diastolic pressure But, on the one hand the nervous type of person does not get **Chronic Idiopathic or Essential Hypertension,** as this variety of hypertension is called to distinguish it from the renal kind and on the other, people with it are usually emotionally stable and in all other respects physically fit It might be due to renal ischaemia and increased secretion of pressor substances by the kidney but, if so why the renal ischaemia? The fact that it seems to run to some extent in families suggests a genetic element is its pathogenesis The blood pressure is also often high in fat people So some maintain that it is related to a sedentary life and over eating Others attribute it, on the other hand, to an over strenuous life The truth is that at present, in spite of the importance of benign hypertension as a factor in the patho genesis of death, its cause remains an unsolved problem

Hypertension of this kind is compatible with many years of reasonable health and is said to be benign In women it may even remit with advancing years often at the menopause In men this rarely happens but it may be found on routine examination of a patient who does not complain of any cardio vascular symptoms On the other hand it predisposes to gradual structural change in the arterioles which control the flow of blood into the capillary bed and although the incidence of hyper tension is equal in the two sexes this comes on much sooner in men than in women The muscle of the media of all the arteries develops hypertrophy at first Then after the lapse of varying intervals of time, degenerative changes set in These start in the intima Spots, flecks and patches of fat develop and may ulcerate breaking *the continuity of the epithelial lining and* predisposing to thrombosis which may block the lumen of an artery altogether Later the media swells, the muscle fibres undergoing hyaline degeneration and sometimes becoming calcified In short chronic idiopathic hypertension leads to very

one explanation of hypertension The resistance to the flow of blood must be increased and the heart is maintaining a higher pressure during systole *and* diastole to maintain the circulation (The systolic is nearly always raised more than the diastolic pressure i e the pulse pressure increased, although this can seldom be detected clinically) Clearly the ' disease under these circumstances is *not* the high blood pressure but the circumstances which render it necessary

In a few cases high blood pressure of this kind proves to be due to coarctation of the aorta in which case the pressure will be found low in the femoral arteries Occasionally it is associated with excessive secretion of adrenaline by a phaeochromocytoma *or with hypercorticalism Further, as has been seen already* the blood pressure, systolic and diastolic, always rises eventually in chronic nephritis and unilateral renal disease due to compensatory vaso constriction in order to ensure the blood supply of the kidneys (In chronic nephritis with hypertension vaso dilator drugs, by calling off this compensatory vaso constriction, may precipitate renal failure) In the vast majority of cases of hypertension, however, no developmental abnormality or endocrine disorder can be discovered Nor is there any evidence of renal disease There is no albumin in the patient s urine and his renal efficiency tests are always well within normal limits But it *must* be due either to peripheral vaso constriction, as in renal and endocrine hypertension or to structural narrowing as in coarctation For, excluding primary increase in cardiac output for which there is no evidence there is no other possible cause (the viscosity of the blood remaining constant) to which it could be attributed And without doubt it is due to *functional* vaso constriction (spasm) in the first instance In the early stages of chronic hypertension the muscle of the arterioles hypertrophies (which would be expected on this theory) and no degenerative changes can be found in either intima or media It is generally agreed therefore that vaso spasm comes first possibly due to diminished renal blood flow and the secretion of pressor substances, and that the degenerative changes found in the more advanced cases follow slowly in *the wake of that Structural change in the small* arteries is the *consequence* rather than the *cause* of hypertension

But why should the small arteries go into permanent spasm

claudication (page 235) Occasionally the arteries in the kidneys degenerate first (arteriosclerotic renal disease) Their blood supply declines albumin appears in the urine renal function starts to fail and, often without any further rise of blood pressure, the patient lapses into uraemic coma

In other cases intense peripheral vascular constriction leads to *arteriolar necrosis all over the body and, occurring in the* kidneys leads to *rapid* rise of blood pressure This is known as **Malignant Hypertension** Nevertheless, it is impossible to draw a rigid distinction between benign and malignant hypertension True that the latter usually starts abruptly and runs a rapidly fatal course, but a man with long standing benign hypertension may have a sudden episode in which his blood pressure rises, associated with some of the symptoms characteristic of malignant hypertension and most of these cases terminate pathologically as malignant hypertension What starts this intense local vascular constriction either in a patient with a previous normal blood pressure or in one with long standing benign hypertension is not yet understood

Most cases of malignant hypertension present with intense headache on account of sudden rise of intracranial pressure due to oedema of the brain These headaches are characteristic They are aggravated by lying down which tends to raise intracranial pressure and relieved by standing up when gravity tends to reduce it So they come on in the early morning particularly on Sunday mornings (when the patient lies in late), and sometimes wake him up at night At first they pass off soon after getting up Later they linger on or come on abruptly at any hour of the day and are sometimes associated with sudden vomiting and in severe cases with abrupt transient loss of sight (amblyopia) or with sudden loss of consciousness and epileptiform convulsions the syndrome known as hypertensive encephalopathy to which reference has been made already Other cases present with visual symptoms due to sudden haemorrhages or exudation at the macula or on account of papilloedema Or less frequently the patient begins to suffer from acute dyspnoea due to his heart failing to maintain the pressure demanded by the general constriction of his arteries Or the main incidence of the necrotic lesions is on those of his kidneys Then he may come complaining of just

similar structural changes in the small arteries to those to which advancing age predisposes in the large ones (page 231) Further their possible functional consequences are identical An artery *may slowly narrow leading to* progressive ischaemia of the part of the body which it supplies It may suddenly get blocked by thrombosis, leading to acute ischaemia It may rupture, giving rise to serious haemorrhage, although this rarely happens except in the retina or in one of the vessels of the brain

About fifty per cent of cases present with increasing shortness *of breath on exertion This is as would be expected For years,* perhaps, the heart has succeeded in keeping up the pressure in the large arteries necessary to maintain the circulation (the patient remaining unaware of his condition) and now, as his coronary arteries begin to wear out, this becomes increasingly difficult So the blood returning to his left ventricle is dammed *back in his lungs (as in aortic disease) which become oedematous* and congested with the result that their vital capacity declines and he begins to get short of breath Further, he is now peculiarly liable to attacks of breathlessness at night He must sit up to breathe and, if he slips down in his sleep, he may get a very bad attack indeed Before long now failure of his left heart is transmitted to his right and he gradually lapses into congestive heart failure (page 168), and slowly dies of it, presenting much the same clinical picture as that of the last stages of valvular disease For the signs and symptoms of congestive failure are always more or less the same irrespective of its primary cause

Other cases present with sudden cardiac infarction (page 233) and the patient s blood pressure is found unexpectedly high or cardiac infarction supervenes in a known case of "hypertensive failure Or the coronary arteries escape and the very first symptom calling attention to long standing benign hypertension may be the result of degenerative changes in arteries elsewhere Headache is seldom due to it but degeneration in cerebral vessels may lead to transient attacks of aphasia, monoparesis or hemiparesis and not infrequently to a *full blooded'* cerebral haemorrhage without any previous warning In another case the retinal arteries are affected first A haemorrhage or a patch of degeneration at the macula suddenly interferes with vision in one eye (arteriosclerotic retinitis) Or progressive narrowing of the tibial arteries leads to intermittent

increases in her urine, which may now boil almost solid, and she swells up with oedema presumably for the same reason as in acute nephritis Further she now begins to complain of violent headaches with vomiting due to oedema of her brain, and may start sudden attacks of loss of consciousness associated with epileptiform convulsions So this condition **Eclampsia,** is clearly yet another cause of the clinical syndrome known as hypertensive encephalopathy Her child now dies and her pregnancy ends in still birth She may even die herself but if she survives her fits remit her blood pressure comes down, although not necessarily to normal, and albumin disappears from her urine *Eclampsia is therefore clearly related to* pregnancy, and if with rest in bed pre eclamptic toxaemia shows little signs of remission as full term approaches, pregnancy is terminated by induction of labour or Caesarean section, both being postponed if possible until the child is viable

The cause of the toxaemias of pregnancy is not known and why some pregnancies should become toxic and not others remains largely mysterious Toxaemia is most common in a first pregnancy, although it may occur quite unexpectedly in any pregnancy, and is particularly likely in any abnormal pregnancy, for example in hydramnios vesicular degeneration of the chorion (hydatidiform mole) and in twin pregnancies Further, the toxaemias of pregnancy are related in some way to a high protein diet Their incidence, like that of diabetes, decreased during both World Wars and a low protein diet is an important factor in controlling toxaemia in the individual case Their incidence has, however, been enormously reduced, in spite of the now high protein diet of the average pregnant woman by ante natal supervision and their severity by starting treatment at the very first sign of toxaemia

Nor is the relationship of pre eclamptic toxaemia to benign hypertension altogether clear The blood pressure normally falls slightly during pregnancy and early benign hypertension in a pregnant woman is therefore likely to be missed Indeed the view is gaining ground that it is the women with a tendency to benign hypertension who develop pre eclamptic toxaemia early in pregnancy Further, not only in them does the blood pressure not revert to normal after the pre eclamptic episode is over but if they become pregnant again they are likely to

not feeling well," on account of uraemia or of frequency of micturition at night A small renal vessel may even give way leading to haematuria or, as so often in benign hypertension, one in the brain leading to sudden loss of consciousness and hemiplegia

On examination the optic discs are invariably swollen (papilloedema) There are also often haemorrhages and some times patches of exudates scattered through the retinae The cerebro spinal fluid pressure is usually raised The blood pressure is *high and the heart* to some extent hypertrophied although in an acute case it has not had time to get anything like as large as it does in chronic benign hypertension The lungs are oedematous to an extent depending on the degree of left heart failure and there is protein in the urine and reduction and fixation of its specific gravity corresponding to the extent of renal involvement If the urea now rises in the blood, the *patient loses weight, becomes rapidly anaemic and soon looks* very ill indeed

The cause of malignant hypertension like that of its benign cousin, a not infrequent antecedent of it remains mysterious, but both conditions are probably due to the same cause acting with different degrees of intensity in people of different constitution It is more common in men, but this statement may reflect the point already made, namely that men stand up to hyper tension less successfully than women On the whole it occurs in steady, stable hard working men but in view of the known control of the sympathetic nervous system over the musculature of the arterioles it is tempting to attribute it to stress and strain Nevertheless it cannot be due to stress alone There must also be other factors in its pathogenesis

Also associated with high blood pressure, and partaking of many of the clinical features of nephritis, are the **Toxaemias of Pregnancy** In a certain proportion of women the blood pressure starts to rise in the fifth or sixth month and albumin appears in their urine With rest in bed and a low salt diet this condition, known as **Pre eclamptic Toxaemia,** usually remits and the patient passes through the later months of her preg nancy and through labour without any further trouble of this kind If, however, it is neglected, and in some cases in spite of all possible care, her blood pressure rises steadily, albumin

One of these factors may be genetic predisposition, either genetic weakness of resistance of the mucous membrane to auto digestion or a genetic tendency to secrete too high a concentration of acid Another may be physical injury such as could be produced by coarse food bolted meals and inadequate teeth or dentures a third chemical poisoning nicotine in tobacco smoke too much alcohol or chemical poisoning via the blood stream, as in uraemia a fourth infection pus from infected gums or infected sputum swallowed instead of being coughed up Age certainly seems to lead to progressive decline in resistance to auto digestion Important too, would appear to be the influence of mental states on the functions of the stomach For not only is gastric secretion under *emotional control as evidenced by Pavlov s experiments on* dogs and observations on men with gastric fistulae, but gastric motility is under it as well Every radiologist has seen a barium meal held up at the pylorus until he makes a joke or the patient s mind is otherwise distracted and knows that in some people mental tension is associated with too vigorous gastric peristalsis and over rapid emptying of the stomach Further ulceration is often precipitated by stress Indeed, it seems probable that the same factors operating to different degrees, at different ages and on different individual constitutions interact to produce simple ulceration of the duodenum in one person and of the stomach in another

Ulceration of the Duodenum is most common in young men but it may start in the teens or in late adult life Women are much less commonly affected than men Genetic factors are certainly important in its pathogenesis A family history can often be obtained and the sex incidence of the disease is striking Most of these patients secrete large quantities of gastric juice containing a high percentage of hydrochloric acid, a constitutional peculiarity in all probability genetic a view supported by the fact that most are in blood group O Further, it is a disease of otherwise fit men with good teeth and sound chests who live well and smoke heavily and seems to occur particularly in those who live driving themselves and other people hard In short it is a disease of the hard working the extrovert and the fit certainly not one of the introvert, the careful the nervous and the psychoneurotic Sometimes ulceration

get pre eclampsia again, leaving their blood pressure higher than it was before (A patient with benign hypertension who becomes pregnant must be watched very carefully) On the other hand a woman starting pregnancy with a perfectly *normal* blood pressure can develop eclampsia, and some of these patients seem to 'skip the pre eclamptic phase of increasing albuminuria and slowly rising blood pressure altogether They suddenly start to have fits almost at full term Only then is albuminuria and high blood pressure discovered This is the commonest variety of eclampsia today and in these cases the blood pressure usually returns to normal after the episode is over A woman who has had acute toxaemia of this kind can be safely allowed to become pregnant again although she *may* get eclampsia again, particularly if one of her pregnancies happens to be in any way abnormal

PEPTIC ULCERATION

Local inflammation and ulceration of the mucous membrane of the upper gastro intestinal tract is common It tends to occur wherever it is exposed to the action of the acid gastric juice containing proteolytic pepsin and therefore in the stomach and first part of the duodenum, in the lower oesophagus when the upper part of the stomach is herniated through the diaphragm (predisposing to regurgitation into it) in the upper jejunum after gastro jejunostomy (an operation now seldom performed on this account), sometimes even after partial gastrectomy of the Polya type (which reduces gastric secretion) and occasionally in a Meckel s diverticulum containing ectopic gastric mucous membrane So at first sight the acid gastric juice appears heavily incriminated (Hence the origin of the term peptic ulceration) But there must be other factors in its pathogenesis anyhow in the first instance For, if it were due to the action of the gastric juice *alone*, it would occur not only in everybody but all over the stomach Indeed the stomach would digest itself and the lines of the sutures after an operation on it would certainly never heal Clearly its mucous membrane must be normally in some way resistant to auto digestion Further, ulceration can occur in the stomach when the secretion of acid is low and sometimes even when it is absent altogether

belching wind and often associated with regurgitation of acid fluid into the oesophagus and mouth, and sometimes of oesophageal pain due to secondary peptic oesophagitis The ulcer is close to the pylorus in these cases and the patient s symptoms due to spasm of it Others complain of actual pain in the epigastrium coming on *two to three hours after* a meal (hunger pain), i e when the acidity of the stomach is starting to rise due in some way to acid acting on the ulcer and relieved dramatically by eating or by taking an alkaline powder or tablet, both of which neutralize acid In these cases the ulcer is farther away from the pylorus and it is these ulcers which tend to perforate

Sometimes the patient vomits, due to a combination of oedema round his ulcer and spasm of the muscle beneath it causing some degree of pyloric obstruction Further, at any moment a chronic duodenal ulcer may bleed What happens then depends entirely on the rate of bleeding If it bleeds quickly and fairly copiously he and everyone else soon know all about it He immediately feels faint and a few minutes later vomits red or dark blood (haematemesis) looking like coffee grounds and during the next few days unless his bowels stop working (as they sometimes do) passes black stools (melaena) due to partially digested blood When on the other hand it bleeds more slowly he does not vomit Rather, he becomes slowly anaemic and if he gives no history of duodenal pain and has not noticed his melaena, the cause of his anaemia may be puzzling at first

The more chronic a duodenal ulcer the less likely is it to perforate because its base becomes more and more fibrotic On the other hand it tends to become adherent to neighbouring structures so that activity now leads to 'penetration Persistent pain in the back may be due to a duodenal ulcer penetrating the pancreas Certainly when pain clearly duodenal in origin in the first instance becomes persistent, i e unrelated to meals it at least suggests involvement of the peritoneum

In long standing cases the formation of fibrous tissue some times leads to chronic pyloric obstruction The stomach now becomes dilated and its muscular wall hypertrophied and the patient starts to vomit large quantities at relatively infrequent intervals, his vomit sometimes containing food which he can

starts suddenly and progresses rapidly More often it starts gradually and progresses slowly with a natural tendency to remit and relapse repeatedly

The very first symptom of an **Acute Duodenal Ulcer** may be a sudden haematemesis and in many of these cases this must be due to superficial ulceration of the mucous membrane and the haemorrhage entirely capillary For, a radio opaque meal carried out ten days or so later (it is not considered safe to do one sooner), often fails to reveal any structural lesion There must have been ulceration at the time to lead to bleeding but clearly it did not extend below mucous membrane level and has healed up already (Where the 'erosion' was is now "anybody s guess" and in an elderly patient it may well have been in the stomach) In others the ulcerative process has already extended deeper and X ray evidence of a 'silent,' i e previously symptomless, ulcer is now found, although ulcers in the *duodenum are far less often silent than those in the stomach* Indeed, the very first symptom of a duodenal ulcer may also be perforation The ulcer has 'gone through' mucous membrane and muscle and reached the peritoneum without causing *any symptoms whatever (Most of these cases give a short* history of previous indigestion) The patient is suddenly seized with acute pain in his upper abdomen and collapses in a state of shock due to violent peritoneal stimulation After a while he *recovers partially but soon his temperature starts to rise* and he begins to complain of generalized abdominal pain due to spreading peritonitis and, as this usually starts in the right iliac fossa (the gastric contents tracking down in that direction), perforation of a duodenal ulcer is sometimes mistaken for perforation of an acutely inflamed appendix

Far more often the patient starts to complain of periodic indigestion, due to recurrent exacerbation and remission of the pathological process, the symptoms of **Chronic Duodenal Ulcer** exhibiting a natural tendency to remit and relapse Typically he has two attacks a year each lasting from a few weeks to as long as three months one in the early spring and another in the autumn In an attack he complains of symptoms of one of two kinds, depending on the *position of his ulcer Most* cases present with the so called pyloric syndrome, i e discomfort in the lower chest coming on *soon* after meals, relieved by

vitamin C deficiency predisposes to it Steroid therapy certainly does It may also follow some indiscretion in diet and an acute ulcer may develop into a chronic one On the other hand, gastric ulcers relatively seldom perforate and those that do, unlike most chronic gastric ulcers, are usually near the pylorus

The symptoms of **Chronic Gastric Ulcer** are much less characteristic than those of duodenal ulcer in which the diagnosis can usually be made with confidence on the history Indeed, a chronic gastric ulcer is often silent only revealed by an opaque meal in a patient who has never had any gastric symptoms Most cases complain of pain related to meals however, although the clear cut picture of ulcer is often clouded by the consequences of the patient s own treatment of himself So often he has stopped drinking beer and become constipated, or started taking stomach powders which have made his bowels loose with the result that, by the time he comes for medical advice organic pain due to his ulcer may be almost submerged in functional pain originating in his colon and it is impossible ever to be quite certain what an opaque meal will reveal in a case of this kind Sometimes in spite of quite a short history it reveals a giant ulcer Then the patient s symptoms often started after a recent sudden dietetic indiscretion or eating something peculiar When the history is long, the ulcer is usually smaller but more fibrotic and correspondingly more resistant to treatment

Sometimes a gastric ulcer becomes adhered to the liver and then may penetrate into it in the same way that a chronic duodenal ulcer may penetrate into the pancreas But they do not often cause obstruction unless very near the pylorus or very near the cardia In women however and for some reason in women only a chronic gastric ulcer on the lesser curve may lead to an hour glass deformity of the stomach This is seldom diagnosed clinically only being discovered on X ray examination of the patient

Whether a simple gastric ulcer ever becomes malignant is still a controversial matter In this country the general view is that this only happens very rarely (The authors of this book have *never* seen it in their experience and in their opinion the risk of malignancy should *never* be advanced as an argument for gastrectomy when the wisdom of it is under consideration)

still recognize as having been eaten two or three days previously On examination gastric peristalsis is often visible and there is splashing on palpation in the upper abdomen Further, he becomes rapidly dehydrated and loses weight, largely on this account Sometimes he develops alkalosis and tetany due to loss of acid in his vomit

Simple (as opposed to neoplastic) **Ulceration of the Stomach** is practically only found on the lesser curve, where the blood supply is least good, and tends to occur in a later age group, i e from the age of forty onwards Again, as in duodenal ulcer, it occurs much more often in men than in women, but while duodenal ulcer is a disease of the fit man who lives well, gastric ulcer seems to be one of the unfit man with deficient teeth or ill fitting dentures, bronchitic chest, kyphotic spine, who eats rough poor quality food Again and again, too, a gastric ulcer starts or relapses (gastric ulcer exhibit the same tendency to remit and relapse as duodenal ulcer, although not so seasonally) after extraction of teeth before dentures are fitted when being uncomfortable they are not used for eating, when bronchitis comes back with the fog in November, and when a man's diet changes for the worse because, perhaps, his wife has died recently Over smoking and excessive beer drinking also seem to be associated with gastric ulcer Kyphosis, too, seems to predispose to it and sometimes a gastric ulcer is precipitated when a patient is put in a plaster for a displaced intervertebral disc So, while genetic and psychosomatic factors seem to be particularly important in the pathogenesis of duodenal, the environment that the gastric mucous membrane is compelled to endure would seem to be most important in the pathogenesis of gastric ulcer But psychological factors also play some part A gastric ulcer often relapses or even seems to start under emotional stress, although that may sometimes be due to the physical circumstances created by the stress rather than to the stress itself The aetiology of most gastric ulcers is probably even more complex than that of duodenal ones

Again ulceration can be acute or chronic and again the first symptom of an **Acute Gastric Ulcer** is often haematemesis For erosion of the gastric mucous membrane tends to occur very easily particularly in an ill man and is common in uraemia and the blood diseases There is also some evidence that

vitamin C deficiency predisposes to it Steroid therapy certainly does It may also follow some indiscretion in diet and an acute ulcer may develop into a chronic one On the other hand, gastric ulcers relatively seldom perforate and those that do unlike most chronic gastric ulcers are usually near the pylorus

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Whether a simple gastric ulcer ever becomes malignant is *still* a controversial matter In this country the general view is that this only happens very rarely (The authors of this book have *never* seen it in their experience and in their opinion the risk of malignancy should *never* be advanced as an argument for gastrectomy when the wisdom of it is under consideration)

Yet in the United States the view is still held that simple ulcers frequently develop malignant change and that a chronic ulcer should be removed on account of that risk alone This divergence of opinion is difficult to explain Possibly the histological criteria of malignancy are different on the two sides of the Atlantic But they are definite enough and this seems unlikely Or it may be that gastric ulcers "behave" differently in the Western hemisphere A third and more likely explanation derives from the fact that peptic ulceration often starts in a primary carcinoma of the stomach Most cases of carcinoma of the stomach starting on the lesser curve present clinically as *simple* ulcers and this may have led to the idea that simple ulcers frequently become malignant

The important complication of chronic gastric ulcer is not malignant change but haemorrhage, and again and again a "silent" gastric ulcer bleeds insidiously and the patient presents as a case of anaemia for which no cause can be found at first On the other hand, a chronic gastric ulcer may suddenly erode a large vessel and cause serious haemorrhage with or without haematemesis depending on the rate of bleeding Further, the patient usually being older and his arteries less capable of shutting down, bleeding is much more dangerous than comparable bleeding from a duodenal ulcer For this reason a patient should not be allowed to enter his fifth or sixth decade of life with an unhealed gastric ulcer

Sometimes even an operation designed to reduce gastric acidity in addition to removing the ulcer (page 385) leads, as did the operation of gastro enterostemy so frequently in the past, to a **Jejunal or Anastomotic Ulcer** at the line of junction of the gastric remnant to the jejunum This may happen within a few weeks of the operation at other times not until ten or more years later The patient now starts complaining of abdominal pain related to his meals again but this time it tends to come on sooner than before and to be felt lower down and on the left side where there is often some deep tenderness on palpation Further, the pain of an ulcer of this type is often relieved by lying down and aggravated by standing up on account of dragging on the inflamed mesentery

Simple **Ulceration of the Oesophagus** sometimes occurs as the result of peptic oesophagitis due to regurgitation of acid

gastric juice into it when the upper part of the stomach is herniated through the diaphragm It leads to pain and difficulty on swallowing sometimes to fibrosis creating a degree of stenosis demanding surgery to relieve it Further this fibrosis also tends to shorten the oesophagus which drags the fundus of the stomach still farther up into the thorax and renders the cardia even more incompetent than before This anatomical state of affairs, known as **Short Oesophagus,** can also occur and occurs with equal frequency as a congenital abnormality in the first place in which case any peptic digestion of the oeso phagus is the result rather than the cause of it The end results of the two conditions are in fact identical and it is always diffi cult to be sure of the primary cause of chronic oesophageal ulceration

THE DEMYELINATING DISEASES

One important disease (important because it is fairly common and highly crippling) and a number of rare conditions are associated with destruction of the white sheaths of the nerves within the central nervous system This process may be local or diffuse and, if local confined mainly to the brain or to the spinal cord Hence, from the point of view of their morbid anatomy (nothing is known about their causation) the different demyelinating diseases of the nervous system

In **Disseminated Sclerosis** patches of inflammation are scattered through the nervous system leading to demyelination of the fibres and to subsequent sclerosis due to excessive formation of neuroglia Their distribution varies and this determines the different clinical types of the disease which tends to occur in early adult life and affect both sexes Occasion ally it follows pregnancy or some acute illness, although it is doubtful if this happens more often than can be attributed to chance Its morbid anatomy suggests an infective origin On the other hand there are no lymphocytes or only a few in the spinal fluid *when in all known infective diseases of the central* nervous system lymphocytosis is the rule A virus theory of its causation has little evidence to support it yet

In the early stages the axis cylinders passing through these areas of inflammation are neither completely nor permanently interrupted So transient symptoms are the order of the day

at first, the most common being central scotomata due to involvement of the optic nerves, paralysis of cranial nerves leading to diplopia, hemiplegia or monoplegia, and retention of urine Later, symptoms tend to linger on, although for years a tendency to spontaneous remissions, or at least amelioration, may persist, often leading to false hopes or justifying faith in some new and fancy form of treatment Gradually, however, the pattern that the disease will take becomes apparent and in general there are two types of it, the cerebellar and the spinal The former leads to the typical picture that clinical experience has painted, namely the characteristic combination of nystagmus, staccato speech and intention tremor, all manifestations of muscular incoordination due to primary cerebellar involvement In the latter the pyramidal tracts are most affected leading to spastic paraplegia with exaggerated tendon jerks, extensor plantar responses and retention or incontinence of urine depending on the relative involvement of the motor and sensory nerves to the bladder There is also usually some loss of sense of position due to involvement of the posterior columns of the cord, but seldom enough to abolish the tendon jerks or render the muscles hypotonic, as in tabes, and seldom any loss of the sensations of pain and temperature due to involvement of the spinothalamic tracts, as in syringomyelia (Even in these spinal cases there is usually some degree of optic atrophy) Now and again a case is met with paraplegia and almost complete anaesthesia up to a certain definite level, the patient presenting as transverse myelitis ' A spinal tumour, haematomyelia or Pott s disease is suspected but the condition eventually proves to be due to a local area of demyelination in his cord

As the disease progresses and the patient becomes bed ridden, he tends to become more and more emotionally unstable, but is mercifully supported by an almost pathological degree of optimism Further, cerebellar and spinal types now merge into one another to constitute a single clinical picture, namely, that of paraplegia with cerebellar ataxia Some cases develop quadriplegia, and in many with particular emphasis of the disease on the cord paraplegia is in flexion with the result that, unless surgical steps are taken to prevent it the patient becomes permanently curled up Broncho pneumonic infection is now

always likely Bed sores are difficult to prevent and infection of his bladder inevitable Some combination of these complications eventually terminates his life

The other two main demyelinating diseases are very rare indeed In **Encephalitis Periaxialis** (Schilder s disease), which tends to occur in children and runs a rapidly fatal course, demyelination is confined to the subcortical region and seems to start simultaneously and symmetrically on both sides In **Neuromyelitis Optica** disseminated lesions in the spinal cord are associated with retro bulbar neuritis which may end in partial or complete blindness due to optic atrophy The onset is acute but after a while the condition may remit spontaneously So a severe case looks like an acute but recoverable form of disseminated sclerosis

REGIONAL ILEITIS AND ULCERATIVE COLITIS

Unlike the stomach and first part of the duodenum the rest of the small gut never seems to ulcerate except in typhoid fever and advanced pulmonary tuberculosis when the patient keeps reinfecting his gut by swallowing his sputum The lower part of the ileum is, however, liable to a type of subacute inflammation which in its appearance resembles tuberculosis But tubercle bacilli are never found in it and laboratory animals inoculated with an extract of it do not develop tuberculous septicaemia Further, the Mantoux test is often negative So although **Regional Ileitis** (Crohn s disease) is no longer regarded as and confused with tuberculosis it is generally held to be inflammatory in nature

Young adults are most affected and males more often than females It usually starts in and remains limited to the lower ileum but it may extend down and involve the caecum Indeed any part of the small or large gut may be involved with segments of normal gut extending between those grossly diseased Inflammation starts acutely with swelling, oedema and ulceration of the mucosa, and progresses steadily leading as it becomes chronic to narrowing of the lumen of the gut the patient s symptoms depending on where it starts and its extent When the disease is limited to the small gut it presents with diarrhoea of the small intestinal type (sometimes with

steatorrhoea), with iron deficiency anaemia and pellaga like symptoms When it has invaded the colon the diarrhoea is more of the colonic type although the patient never passes blood in his stools (Sometimes he presents with a vesico intestinal fistula) More often symptoms remain in abeyance until fibrosis begins to cause stenosis of the gut (often first at the ileo caecal valve) leading to colicky abdominal pain and ultimately to subacute intestinal obstruction

As regional ileitis may extend down into the colon and involve the caecum and ascending colon it is always a possible cause of clinical **Ileo-colitis** This condition is characterized by pain in the right iliac fossa, diarrhoea without blood and X ray deformation of the proximal colon, but no distinction can be made on histological grounds (when a piece of tissue is removed at operation) between regional ileitis involving the caecum and right sided ulcerative colitis All that can be said is that ileo colitis seems to be a connecting clinical link between these two conditions

In the majority of cases **Ulcerative Colitis** starts in the lower colon, where the faeces are normally hard, and extends up Thus it is unlike regional ileitis, which tends to start in the small intestine and extend down Unlike it too, the patient is more often female than male, although again young adults are most often affected particularly those conscientious to excess and emotionally immature, and the disease often seems to follow a period of stress or a nervous shock Some times it starts against a background of "normal bowels" but not infrequently against one of habitual aperient taking or a natural tendency to looseness The onset is often sudden with abdominal pain and loose, blood stained, mucus containing stools, although the amount of blood and mucus often bears little relation to the amount of ulceration Sigmoidoscopy now reveals a congested mucous membrane with patches of ulcera tion and an opaque enema shadows a tape like looking colon due to absence of haustration of it In a severe case these changes extend right round to the caecum Sometimes they are more marked in the proximal colon, usually in patients without blood in their stools and, as already pointed out, it is these cases which link ulcerative colitis with regional ileitis invading the caecum through clinical ileo colitis

The course of ulcerative colitis is exceedingly varied Some patients run a high fever and die in a few weeks Most remit and relapse relapses often being precipitated by emotional stress, with an overall tendency downhill A few recover naturally Others become chronic and run the risk of chronic anaemia, intestinal obstruction, perforation of an ulcerated area behind chronic obstruction and carcinoma Some develop cirrhosis of the liver or portal pyaemia This is hardly surprising The liver supplied by the portal blood must bear the full brunt of any infection of the gut A perinephric or sub diaphragmatic abscess develops occasionally Other stranger complications include clubbing of the terminal phalanges bilateral irido cyclitis, indolent ulcers between the fingers and massive necrosis of the skin

In other patients (particularly the elderly) the disease starts insidiously and tends to run a still more chronic course After years of normal bowel action or constipation and the misuse of aperients, a man or woman begins to get diarrhoea A new growth is naturally suspected but a barium enema is negative and sigmoidoscopy reveals **Granular Proctitis,** i e inflammation of the lower end of the colon without ulceration above The course of these cases is extremely varied and, although this name is given them it would be idle to pretend that we understand their true pathology A few recover on medical treatment Many run on unchanged for years but at any moment perhaps when things are bad, granular proctitis can flare up into true ulcerative colitis Sometimes ulcerative colitis in a young person actually starts in this way

THYROTOXICOSIS

Thyrotoxicosis is that condition in which the secretion of thyroxine has risen above the needs of the body It can occur in two different ways Sometimes it is caused by an adenoma of the thyroid gland A small part of it is over producing This type is called secondary thyrotoxicosis (secondary to previous enlargement of the thyroid) and will be described where it belongs namely under benign new growth (page 215) In other cases it is due to the anterior lobe of the pituitary secreting too much of its thyrotropic hormone with the result that the *whole*

thyroid is forced into over action and the *whole* gland enlarges Further, as over secretion by the pituitary is usually also associated with over secretion of the hormone which regulates the amount of fat in the orbit and the nutrition of the extrinsic muscles of the eye, thyrotoxicosis produced in this way is associated with some degree of proptosis and widening of the palpebral fissures This type is known as *primary* thyrotoxicosis although it is really *secondary* to over action of the pituitary It is sometimes also known as exophthalmic goitre

Primary Thyrotoxicosis is more common in women than in men and most common in young women, but may occur at any age between puberty and the menopause, and frequently follows a period of emotional stress although rarely of the kind that is associated with anxiety about self Thyrotoxicosis is not a disease of the anxiety neurotic Rather, it is associated with worry and anxiety about other people or external things For example, it is common in young married women round about what should be the time of the arrival of the first child Inquiry now often reveals the practice of unsatisfactory methods of birth control notably coitus interruptus, or the desire of the patient to have a child when her husband does not want one In a single woman it may follow the death of an aged parent to whom her whole life had been devoted and which is now left blank in consequence At any age it may follow some emotional shock, although there is usually a latent period of some weeks between it and the first onset of symptoms, which may then be quite abrupt In all cases one cannot but suppose that the patient is so constituted as to react to stress in this thyrotoxic way, that the disease is in fact the *net* result of emotional trauma and genetic predisposition On the other hand, it would be wrong to suppose that emotional factors can be found to account for the onset of every case Primary thyrotoxicosis sometimes starts for no apparent reason in an apparently perfectly steady kind of person

Its *symptoms* can be divided into three groups according to the mechanism of their pathogenesis One group is due to the increased metabolic rate This accounts for the rapid loss of weight, in spite of a good appetite for the patient always feeling the heat and for his hot skin, and in part for his tachycardia (due to his high circulation rate) and in part for his

moist skin keeping his body temperature down A second group must be due to thyroxine sensitizing his body and mind to the action of adrenaline, and almost certainly to actual increased secretion of it Hence his nervousness and tremor, the quick movements of his body, his dilated pupils and in part his tachycardia and palpitation his sweating and his staring eyes The third group of symptoms are due to over secretion, as already explained, of the anterior pituitary lobe hormone which controls the tissue in the orbit and the nutrition of the extrinsic muscles of the eye Hence his proptosis and exophthal mos and the classical eye signs associated with the disease his inability to wrinkle his forehead on looking up (von Graefe s sign), his lid lag resulting in white sclerotic standing out above his coloured iris on looking down (Stellwag s sign) and his inability to converge his eyes (Moebius sign)

A few cases remit particularly if any emotional cause can be removed But in most this has no effect Emotional trauma seems to have started structural change associated with pro found functional disorder and these persist indeed go straight ahead Some cases left to themselves run an acute course Crises may occur associated with collapse owing to a combina tion of *failure of cardiac output associated with peripheral* vascular failure (They may be precipitated by the abrupt onset of auricular fibrillation) Sometimes the proptosis and exoph thalmos become extreme, due to accumulation of fat in the retro orbital tissue the patient now running the risk of ulcera tion of his cornea, or infiltration of the extrinsic muscles of his eyes may lead to strabismus and diplopia (It is these cases which are sometimes associated with extreme weakness and flabbiness of all the peripheral muscles the so called thyrotoxic myopathy) In an acute or subacute case the patient s nutrition may begin to suffer on account of his increased metabolic rate His liver may become cirrhotic (page 50) or hypo proteinaemia combine with auricular fibrillation and congestive heart failure to lead to chronic oedema of his legs In elderly patients, particularly, the myocardium suffers and the auricles may start to fibrillate while the normal maintenance of the matrix of bone may fail (osteoporosis) leading to secondary decalcification of the skeleton

Thyroidectomy and the administration of radioactive iodine

will reduce the metabolic rate to normal and abolish the nervous symptoms associated with the disease (page 387) but these methods of treatment may have no effect on the patient's exophthalmos. Indeed, on account of the inhibiting influence of the thyroid back on the pituitary, proptosis may even increase and lead to difficulty in eye movements, sometimes resulting in double vision, partly, as has been seen already, due to increase in the amount of fat in the orbit and partly due to structural changes in the extrinsic muscles of the eye. It may even result in primary optic atrophy and failure of vision. Far more often this condition, **Exophthalmic Ophthalmoplegia,** is unassociated with appreciable over action of the thyroid gland. The pituitary is secreting too much of the hormone which controls the orbital fat and nutrition of the muscle of the eye (to which no name has yet been given) but the normal amount of the thyrotropic hormone. Why this sometimes happens still remains mysterious.

PRIMARY BRONCHIAL ASTHMA

In primary bronchial asthma the previously normal bronchial mucous membrane suddenly swells up and the muscles of the bronchi contract in spasm impeding the free flow of air in and out of the lungs. But, as expiration is always mechanically more difficult than inspiration (the body normally relying on the passive recoil of the chest after the muscular act of inspiration for that purpose), it is expiration which is so embarrassed in the acute attack and which leads to severe respiratory distress. Attacks usually start at night and may last several hours or even several days. At first at any rate, all physical signs disappear as soon as an attack is over.

Some cases are clearly due to sensitivity to animal emanations, notably that of horses, and certain organic dusts. Allergic asthma of this kind has already been described. Occasionally, too, it is due to idiosyncrasy to a chemical substance, notably acetylsalicylic acid. Seldom, however, can bronchial asthma be explained so simply and the pathogenesis of most cases is far from clearly understood. The basic factor would appear to be an inborn way of reacting. Just as some people react to emotional stimulation by excessive secretion of thyroxine, so

others react to it by getting broncho spasm, instead of just suffering from over stimulation of the sympathetic nervous system leading to tachycardia palpitation and sweating as a normal person does when upset So an attack of asthma in a predisposed child can be brought on by any emotional trauma for example, being afraid of and being compelled to sleep in the dark or in a room with some other child disliked At that age the prognosis is good Children properly handled and not fussed (the word asthma should be forbidden in the family) usually grow out of it Most cases start in early adult life however, and a single emotional cause can seldom be discovered In these the prognosis is never so good

A patient who suffers from attacks of asthma soon begins to live in fear of them and before long this fear dominates his mind So a vicious spiral piles up Fear of an attack leads to one, and each attack increases his fear, predisposing to another Further asthma predisposes to infection and before long the asthmatic becomes to some extent bronchitic and at this point sensitivity now often seems to come to play a part in the pathogenesis of the disease Many asthmatics although their attacks cannot be traced to specific antigens are people who easily become sensitized to them and before long the patient finds that his attacks are precipitated not only by emotion and fear, but also by dusts and infection to which he has now become peculiarly sensitive Only on this basis is it possible to explain the fact that some asthmatics react well to steroid therapy although no specific sensitivity can be discovered to account for their attacks

Steroid therapy has improved the prognosis but the fact remains that, although bronchial asthma is primarily a reaction between genetic predisposition and emotional stress and in most cases only secondarily a sensitivity (and in no sense a hypersensitivity) disease, it can be and often still is fatal in the long run For unless attacks can be completely prevented (and in adults this is seldom possible), each one predisposes to more infection and infection to yet more sensitivity and so to more frequent attacks, and therefore to yet further infection Thus the patient who started with primary bronchial asthma becomes a chronic bronchitic, just as the patient with primary bronchitis becomes to some extent asthmatic Further, bronchitis leads to

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a herald patch, consisting of an oval rosy plaque, becoming fawn coloured when it starts to scale, appears somewhere on the trunk, occasionally on a thigh and less frequently more peripherally A week or two later the generalized eruption starts and is usually confined to the body but sometimes extends up the neck and on to the proximal parts of the limbs The rash is usually macular giving rise to characteristic medallions which run parallel with the ribs and may be up to 2 cm in length, and start to scale away in a few weeks In other cases it is follicular and more difficult to recognize and the mistaken application of fungicides or antibiotics may seriously retard its natural tendency to remit

NEW GROWTH

The term new growth (neoplasia) is a bad one to express the nature of the conditions which it includes Every living thing animal or vegetable is a *new* growth Rather what is meant by it is not new but *abnormal* growth that condition in which certain cells start to multiply out of all relation to the structural and functional requirements of the body as a whole So, on analogy with a human community new growth is an essentially anti social process And this definition differentiates it, as clearly as any can from all other forms of growth not only from embryonic and post natal development but also from hyper trophy in response to demand on function and from the reaction of the tissues to irritation and infection

Developmental Tumours

Nevertheless normal merges into abnormal growth In about one per cent of pregnancies the mass of cells resulting from the early divisions of the fertilized ovum proceeds to duplicate the genetic plan giving rise to identical twins, normal people to everyone else but abnormal in relation to each other If however, the decision to go off on its own is taken by one cell at a later stage (in our ignorance of the causation of identical twinning that seems the only way to put it), the twin (if it can still be so called) is bound to be included in and likely to interfere with the further development of the other to such an extent that its continued life is impossible When a child is

emphysema and emphysema embarrasses the right heart and a life of bronchial asthma can end in death from right heart failure So a condition *primarily due to a genetic predisposition* of the body to behave in a certain way under emotional stress can lead to structural change and functional disturbance which terminates its life *prematurely*

OBSCURE SKIN DISEASES

Diseases of the skin, as has now been seen may be due on occasions to clear cut causes, a genetic defect, physical injury, a chemical irritant acting from without or through the blood, sensitivity, local or general infection, or to complex interaction between factors of this kind, their interaction further complicated by hyperidrosis, seborrhoea, hypersensitivity, itching and scratching and the influence of mind on body, as has been discussed under the hypersensitivity diseases

A number of skin diseases, however, still defy analysis on these lines, and among them is a very common one, namely **Psoriasis** a condition characterized by sharply marginated raised red areas of abnormal scaling due to some fault in epidermal cell formation resulting in abnormal horn cells It *usually starts in the second or third decade of life In children* it sometimes follows a streptococcal throat and very often there is a history of it in a parent Other factors in its pathogenesis *include acute infection, physical injury of the skin and emotional* unrest It does not react to steroid therapy and cannot be regarded as a hypersensitivity disease

Very frequently it starts on the extensor aspects of the knees and elbows and remains localized to these sites for years, but it may suddenly spread after some acute infection or during a period of emotional stress all over the body In other cases it is generalized from the start and tends to run a chronic course, remitting for a while and then *relapsing when physical health* falls low and during periods of stress Few cases beginning in adult life recover completely, but most patients learn to live with *their psoriasis and on the* whole the intensity of it tends to decline with the passage of the years

Another obscure skin disease is **Pityriasis Rosea** Following a brief period of general malaise, coryza or a mild sore throat,

lead to bleeding In the nervous system they are liable to cause subarachnoid haemorrhage or epileptic fits

Most new growth starts after differentiation of tissue in the primitive layers is complete and consists of cells of one kind only and is therefore, for example, of epithelium of fibrous tissue, of a gland, of bone of cartilage or of muscle

Benign and Malignant Growth

New growth, as above defined is of one of two kinds irrespective of the age of the person in which it starts It is always benign *or* malignant There is no half way house no gradual transition between the two True that there are all degrees of malignancy True also that a benign tumour can become malignant (A malignant one never reverts to being benign) But the change is always abrupt and between benign and malignant tumours there is for practical purposes at any rate a great gulf fixed although in the case of certain slow growing tumours of the nervous system it may be difficult to tell at first whether they are really malignant

A benign tumour enlarges slowly, competing except on the surface of the body and in the lining membrane of a hollow cavity such as the stomach, colon or bladder with the surrounding tissue cells for space They on their part react in much the same way as to any foreign body So a benign tumour often soon becomes surrounded, particularly in tissue of a certain type by a fibrous capsule which is probably one factor in limiting its size (most benign tumours gradually stop growing) and out of which it can often be shelled like a pea out of its pod But pea and pod are both part of one design Not so the tumour and its capsule the former is pathological the latter the natural reaction of the body

A malignant tumour behaves differently Instead of just pushing out at its periphery it sends out processes which grow actively into the surrounding tissue Hence the origin of the unfortunate word cancer because in section a malignant growth appears to be putting out claws But there is much less new about behaviour of this kind than might have been supposed These processes insinuate themselves between the tissue cells in the same way as, at a certain stage in its development, the embryo sends out processes (the chorionic villi)

born dead, examination may reveal a ' twin" included in its body

Far more often twinning in this sense starts later still or, perhaps more likely, starts early, but for some reason the development of the included twin is delayed, and then the cells left behind hasten to catch up" leading to a structureless mass derived from all three primitive layers This may contain skin, hair, teeth and nerve elements, derived from the ectoderm, muscle, bone and cartilage, derived from the mesoderm, gut and gland, derived from the endoderm Whether a '*tumour*' (the word is synonymous with new growth) of this kind, a **Teratoma,** should really be regarded as an included twin is entirely a matter of definition All points in the continuum of twin to teratoma have been described Further, teratomata may occur anywhere although they are usually found in the ovary or testis and only discovered in adult life According to one theory they start in early embryonic life, the normal development of a "totipotent" cell, i e one capable of giving rise to all three layers of the embryo, was temporarily arrested Alternatively, they may be due to parthenogenesis, i e spontaneous development without fertilization, of a germ cell in an ovary or testis

Once the development of the fertilized ovum has advanced beyond the point of differentiation into ectoderm, mesoderm and endoderm, tumour formation becomes more circumscribed From now onwards growth from a cell which has "gone wrong' *can only produce a structureless mass of tissue of the kind that* the primitive layer from which it is derived is capable of producing Thus an epidermal cell may give rise to a **Dermoid Cyst,** containing skin, hair and sometimes teeth Cysts of this kind tend to develop in the mid line, particularly in the mediastinum, and in the ovaries and testes Occasionally they rupture More often they lead to mechanical trouble on account of the size to which they eventually attain **Angiomata** are due to a mesodermal cell running off the developmental rails' and leading to a cluster of arteries, capillaries or veins, which serves no functional purpose and may be a source of awkwardness or danger Under or in the skin (one variety of birth mark) they are merely unsightly In the gut they sometimes

Malignant growth is subdivided into two types carcinoma and sarcoma The former starts in epithelial cells covering surfaces and, as most such cells are derived from ectoderm or endoderm, it can be said to arise in the main from tissue of ectodermal or endodermal origin Sarcoma, on the other hand, starts in connective tissue and therefore in cells of mesodermal origin Any attempt to classify new growth on an embryological basis has, however now been practically abandoned Indeed, no system of classification is altogether satisfactory a good example of the kind of difficulty encountered being afforded by the rare growth **Endothelioma** of the pleura As it is derived from cells covering a surface it should, according to the definition given be called a carcinoma But the pleura is not true epithelium Further it is mesodermal in origin So this growth is sometimes called a mesothelioma Other important tumours which defy exact classification are met in the central nervous system and in the blood forming tissues What matters, however is not classification something which the mind of man endeavours to impose (unsuccessfully so often) on nature in order to simplify a problem for the benefit of his limited understanding, but the recognition of tumours clinically and pathologically and knowing what each one is likely to do as a guide to prognosis and treatment

Benign Neoplasms

Benign new growths are called after the type of tissue in which they arise, qualified by the organ of the body in which they start Thus as we have already seen, a tumour consisting of an abnormal arrangement of blood vessels is an angioma and as would be expected one consisting of lymphatic vessels a much less common condition is called a lymphangioma A benign tumour of ordinary connective tissue is a fibroma of fat, a lipoma of cartilage, a chondroma of bone, an osteoma, of bone marrow a myeloma of striped voluntary muscle, a myoma of unstriped involuntary muscle a leiomyoma of skin or mucous membrane, be the latter of intestine, rectum or bladder, a papilloma and of any gland for example breast, thyroid or liver an adenoma Further some benign tumours have acquired popular or pseudo scientific names Thus a papilloma of the skin is a wart of rectal or uterine mucous

which penetrate the blood spaces (sinuses) in the hypertrophied mucous membrane (decidua) of the pregnant uterus So also it is that, "taking a leaf out of the chorionic book, a malignant growth infiltrates behind the lines ' For, although the tissues treat it like any foreign body and "endeavour" to *throw a fibrous capsule round it, these processes burst through* it almost as quickly as it forms So the reactions of the body, instead of surrounding it with a capsule which limits its advance, provide it *with a stroma which supports its growth* And this is even more important than might appear at first sight This stroma is not just inert scaffolding Rather new blood vessels form in it with the result that the reactions of the body maintain the blood supply of the tumour destined to destroy it If on analogy with a human community all new growth is anti social, malignant growth is the most revolution ary act that can assail the body politic

The rate at which new growth advances depends on its malignancy and on the strength of the opposition of the body to it The former varies for reasons little understood Certain types of tumour are more malignant and grow and infiltrate more rapidly than others The strength of the opposition also varies, depending on the nature of the tumour and on the type of tissue in which it is growing When it is fairly vigorous, much fibrous tissue is formed and the growth becomes fibrotic, the so called *scirrhous* variety of tumour More often the reactions of the tissues are half hearted and the growth remains soft and cellular Then, although it may die in the centre (necrosis) from want of blood, it advances rapidly by infiltration at its edges living on the land ' Before long it invades a lymphatic channel and a bit breaking off is carried in the current to be arrested, just as bacteria are usually arrested, at the first lymph node But, while bacteria are soon destroyed by the inflammatory reaction which ensues, a bit of growth continues growing almost unopposed, leading to a secondary deposit or metastasis Thence *in due course this process is repeated, and the growth* ' moves on one until before long a chain of "secondaries in glands leads away from the primary in the direction of lymphatic flow Sometimes malignant growth gets into a main lymphatic channel, thence into the superior vena cava and thence often to the lungs Sometimes it is broadcast by the blood

severe headaches, and sometimes to pressure on the optic nerves, leading to optic atrophy and failing vision Sometimes too, it interferes with other aspects of pituitary function The sexual cycle may cease in women and men become impotent due to secondary failure to secrete the gonadotropic hormones Indeed, cases with bony changes alone sometimes prove to be due to simple hyperplasia rather than to a circumscribed adenoma of the gland

A much more common example of an adenoma leading to over production of a hormone is **Secondary Thyrotoxic Goitre** As has been seen already (page 203), the thyroid may start to secrete too much thyroxine due to primary over action of the pituitary (Hence in these cases the simultaneous onset of the eye signs, the diffuse enlargement of the gland and the thyrotoxic symptoms) Or one or more adenomata may develop in a thyroid gland but at first, indeed often for years although it is large and nodular the production of thyroxine does not rise above the requirements of the body as a whole Then, often round about the menopause (secondary toxic goitre is also more common in women) an adenoma may suddenly start over producing leading to the same symptoms as in primary thyrotoxicosis with the important exception of the eye signs, the pituitary in these cases *not* being in any way responsible for the patient s condition Thyrotoxicosis at this age is very liable to affect the myocardium adversely often precipitating auricular fibrillation leading to congestive cardiac failure

Excessive secretion of parathormone due to an adenoma of one of the parathyroid glands embedded in the thyroid (and occasionally due to hyperplasia of all four) **Hyperparathyroidism,** is a rare condition Most cases (the disease can occur at any age) present with swelling deformity and sometimes fracture of the bones In others the bone changes are relatively slight and the patient complains of muscular weakness and drowsiness and develops myocardial failure the diagnosis only being made by finding a high level of calcium in his blood Occasionally he presents with a renal calculus or with nephritis and renal failure due to diffuse deposition of calcium in both his kidneys

membrane, a polyp The common benign tumours of muscle and fibrous tissue starting in the uterus are known as 'fibroids

In general benign tumours *seldom cause trouble Indeed*, many, for example adenomata in the kidney, fibromata in connective tissue and small fibroids in the uterus, are only discovered on examination of the body after death Some, growing near the surface, are discovered accidentally, for example, an adenoma of the breast and lipomata under the skin Others are both obvious and sometimes embarrassing angiomata often unsightly and warts (papillomata) easily *getting knocked A meningioma is bound to cause more serious* trouble growing on the surface of the brain it may lead to epileptic fits, enlarging in its substance to rise of intracranial pressure, developing in the spinal canal to pain due to pressure on a sensory nerve root or to paralysis due to pressure on the cord Fibroids in the uterus often lead to menorrhagia and anaemia A papilloma in the renal pelvis or bladder can also bleed and lead to anaemia A benign tumour of the ovary may give rise to an enormous cyst while vesicular degeneration of the chorion, hydatidiform mole a form of benign neoplasia, can render the continued development of the fertilized ovum impossible Further, benign tumour cells continue to function But their activity is not automatically adjusted to the requirements of the body as a whole and a benign neoplasm of an endocrine organ may throw endocrine secretions out of gear The total output of the hormone is now in excess of the requirement of the body as a whole Hence a number of *clinical* conditions to many of which names were given long before their pathogenesis was understood

An adenoma of the acidophil cells in the anterior lobe of the pituitary results in over production of the growth factor If this starts in early life, it leads to **Gigantism,** if in adult life, after the epiphyses have fused with the diaphyses, to **Acromegaly** Under the latter circumstances any further increase in stature *is impossible and over secretion of the growth factor can only* cause increase in the weight and width of the bones, most noticeable in the hands which become spade like, and in the jaw and lower part of the face In some cases a pituitary adenoma also causes rise of intracranial pressure, leading to

reason it is more common in men than women and supervenes in late adult life Like all forms of benign new growth it may become malignant leading to osteogenic sarcoma

Carcinoma

Carcinoma as above defined, i e malignant growth of epithelium covering surfaces and therefore usually of ecto dermal or endodermal origin is of two main kinds depending on the two main types of epithelium in which it may start, namely, squamous (stratified) and columnar (glandular) the latter often infolded into pocket glands and so not only lining cavities such as those of stomach and colon but often constituting the internal surface of apparently solid organs such as the liver Hence the two main varieties of this type of malignant growth, squamous carcinoma* and adeno carcinoma (Both can give rise to clinical malignant papillomata, i e *projections above a skin or mucous membrane surface*) But squamous carcinoma is not confined to parts of the body where only squamous epithelium exists As the result of chronic irritation columnar can become converted into squamous epithelium and squamous carcinoma therefore start where columnar epithelium used to be Squamous epithelium again as the result of chronic irritation, can also become piled up into several layers and keratinized giving rise to white patches on a previously smooth pink mucous membrane This condition, known as **Leucoplakia,** most common in the mouth and on the vulva often develops into squamous carcinoma and is regarded as a pre cancerous condition In general squamous carcinoma is less malignant than adeno carcinoma The latter is soft and vascular and advances rapidly but may get held up by an intense fibrotic reaction of the tissues in which it is growing with the result that its progress is delayed Hence scirrhous tumours of which the best example is scirrhous adeno carcinoma of the breast

Some carcinomata occur occasionally in relatively early life notably those of stomach and rectum Most are rare under forty Some are more common than others notably those of the stomach colon and rectum in both sexes, of the breast

* In certain situations notably on the lip tongue and skin it is not uncommon to refer to a squamous celled carcinoma as an epithelioma.

An adenoma of the islet cell tissue of the pancreas gives rise to excessive excretion of insulin, **Hyperinsulinism**, and to transient attacks of hypoglycaemia sometimes resembling those due to an overdose of insulin or the dumping syndrome after gastrectomy More often the patient's symptoms take some odd neuro psychiatric form and he is misdiagnosed as hysteria, epilepsy, a hypothalamic tumour or endogenous depression A benign tumour of the chromaffin cells in the suprarenal medulla, a **Phaeochromocytoma,** leads to excessive production of adrenaline or nor-adrenaline, which may occur in bursts, as in hyperinsulinism, leading to hypertensive crises associated with sweating, palpitation, headache, vomiting and shortness of breath Between them the patient may feel perfectly well In other cases the over secretion of adrenaline must be steady for he comes complaining of headache and shortness of breath, and on examination his blood pressure is raised and he is found to have papilloedema already

An adenoma of the adrenal cortex leads to excessive secretion of the steroid hormones, **Hypercorticalism** (Cushing's syndrome), the physiological antithesis of hypocorticalism (It can also be due simply to hyperplasia of it and is more common in women than in men) The face grows round (moon face) and the complexion cyanotic (as in the over administration of steroid hormones in the treatment of a hypersensitivity disease) and fat is deposited on the body while characteristic striae develop round the lower abdomen The legs remain thin, until oedema develops, due to retention of sodium and chloride, and the blood pressure rises, again as in the administration of steroid hormones therapeutically Women develop amenorrhoea and tend to grow hair on the face (hirsutes) In men a tumour of the cortex leads to feminization and is usually malignant In children adenomata of the cortex lead to virilism and sexual precocity

Another classical disease which must be regarded as diffuse benign new growth is **Osteitis Deformans** (Paget s disease) It is characterized by uncontrolled over growth of bone out of relation to the needs of the body This tends to occur in the vault of the skull, so that the head gets larger and the patient finds that he requires an increased size in hats, in the tibiae, which become curved forwards, and in the pelvis For some

localized secondary deposits predisposing to spontaneous fractures And malignant growth is particularly liable to invade blood vessels and cause haemorrhage, often of the silent kind so apt to be neglected Thus blood in the sputum may be the first sign of carcinoma of a lung, in the urine of carcinoma of a kidney or the bladder, and in the stools of a carcinoma of the colon or rectum Inter menstrual bleeding may be the first symptom of carcinoma of the cervix or body of the uterus

In other cases its first symptoms are mechanical in origin A primary may be discovered accidentally in a breast or secondary glands suddenly felt above a clavicle Inside the skull or spinal column, unless it destroys old as quickly as it forms new tissue, secondary carcinoma is bound to lead, like an enlarging benign tumour in these situations to rise of intra cranial pressure and spinal compression respectively Further, destruction of nerve cells usually leads to localizing signs for example invasion of the left cerebral cortex, to weakness of the right hand and aphasia In the spinal cord secondary carcinoma is particularly likely to press on a posterior nerve root and cause pain referred down an arm or leg on an anterior root and lead to paralysis of the lower motor neurone type or on both anterior and posterior spinal nerve roots simultaneously Carcinoma may also obstruct a hollow tube A primary in a main bronchus may lead to collapse of that lung a primary in the pancreas block the common bile duct or a secondary in the hilum of the liver the hepatic duct leading to obstructive jaundice Obstruction of the lumen of some part of the gastro intestinal tract is also common Thus carcinoma may block the oesophagus, so that the patient cannot swallow the pyloric outlet of the stomach so that he must vomit or the colon so that its contents cannot pass leading to chronic or sub acute intestinal obstruction Starting in the prostate it may lead to increasing difficulty in passing urine culminating in acute retention Obstructing veins or lymphatics it may cause oedema of an arm or leg while secondary carcinoma of the liver may block the portal vein predisposing to ascites (Ascites is however usually due to irritation of the peritoneum by multiple secondary deposits) Carcinoma of the kidney (hypernephroma), a growth which may attain to a very large size is rare but may occur at any age and is particularly important clinically on

ovary and cervix uteri in the female, and of the prostate in the male Some seem to be on the increase, notably carcinoma of the lung Others continue to remain rare, for example, carcinoma of the accessory sinuses of the nose, carcinoma of the small intestine, and primary, as opposed to secondary, carcinoma of the liver Some carcinomata are more common in one sex, notably carcinoma of the lung, which is more common in men, but the overall incidence of carcinoma in both sexes is the same Carcinomata in certain organs are more malignant than in others in the sense that they metastasize more quickly, for example, carcinoma of the ovary, stomach and testes Some carcinomata have a tendency to metastasize to special tissues, so much so, indeed, that clinical evidence of new growth in one place raises the probability of a silent primary in another for example, a secondary in the liver, a primary in the gastro intestinal tract, in the brain, a primary in a lung, in bone, a primary in thyroid or breast These facts are well established but all have not been satisfactorily explained

The cells of a malignant tumour multiply rapidly and soon revert to a primitive undifferentiated type (anaplasia), losing many of the characteristics by which they can be normally recognized So unless circumstantial evidence of their primary origin *is available it may be difficult by merely looking* at sections of a secondary to decide the tissue whence it is primarily derived For example, when an enlarged gland is excised from the neck although the pathologist may be confident that it is secondary carcinoma, he can seldom pronounce on its primary origin The cells in it are so primitive that it might equally well hail from stomach, bronchus, larynx or thyroid or even from a kidney or an ovary

Benign new growth tends to exalt function over and above the requirements of the body, malignant to depress it below its proper level Primary carcinoma of the thyroid, for example, may lead to failure of secretion of thyroxine and to symptoms identical with myxoedema Far more often the functional consequences of carcinoma are due to invasion and destruction of other tissue rather than to failure of function of the organ in which it starts For example, a small primary in thyroid, bronchus or prostate may lead to diffuse carcinomatosis of bone with destruction of its marrow and severe anaemia or to

Being so close to the middle line it is liable to lead to quadriplegia, as well as to acute rise of intracranial pressure due to obstruction of the ventricular system, and to ataxia of movement, due to involvement of the cerebellum A tumour arising from the cells lining the central canal and the ventricles is known as an **Ependymoma** Occurring in the neighbourhood of the Sylvian aqueduct it occasionally leads to intermittent blocking of the ventricular system and to recurrent attacks of violent headache and vomiting due to sudden rises of intracranial pressure In the spinal canal it causes spinal compression like any other spinal tumour

Sarcoma

Sarcoma is circumscribed malignant growth starting in connective tissue and therefore in cells of mesodermal origin It tends to occur earlier in life than carcinoma and is more malignant

Osteogenic Sarcoma is among the most malignant tumours Children and young adults are most often affected but no age is exempt and it metastasizes rapidly often to the lungs It usually starts on the inner surface of the periosteum towards the end of one of the long bones and giving rise to pain swelling and tenderness mimics osteomyelitis But the characteristic formation of spicules of bone running at right angles to the periosteum in an X ray picture reveals the diagnosis Sometimes it starts deep in bone causing local destruction and predisposing to a pathological fracture **Lympho-sarcoma** is also highly malignant *The tumour, composed of immature lymphocytes* usually begins in the cervical and less commonly in the mediastinal glands, a tonsil or the lymphatic tissue of the small gut where it may start an intussusception Neighbouring structures are invaded early and widespread metastasis is the rule It *is commonest in the first two decades of life (children* sometimes develop leukaemia *vide infra*) and also, strangely in the elderly, in whom it tends to run a less malignant course without any alteration in the blood picture **Fibro-sarcoma** can start in any tissue of mesodermal origin, in fibrous tissue anywhere and in plain or striped muscle All growths of this kind are pathological curiosities, being very rare indeed

account of the many ways in which it can present It usually leads to haematuria but metastases elsewhere, frequently in the brain or the glands of the neck, may first announce its presence Other cases present with fever, like some cases of carcinoma of the stomach

The skin is a complex structure consisting of many types of cells and liable to new growth, both benign and malignant, of many different kinds **Basal Celled Carcinoma** (rodent ulcer) can occur anywhere and at any age but usually in the fifth decade of life or later and on the face between the levels of the eyebrows and the mouth It erodes deeply and may cause haemorrhage but on the whole runs a chronic benign course Metastasis is rare **Squamous Celled Carcinoma** tends to fol low X ray burns and other forms of chronic irritation Its malignancy varies and metastases may occur Lentigines, pigmented macules, are very common and normally quite unimportant but every now and then one provides the start of a **Malignant Melanoma,** at one time called melanotic sarcoma It may also originate in the choroid and is the most malignant tumour known

Tumours of the nervous system, also developed like the skin from the ectoderm may originate in the meninges, in the brain, in the lining membrane of the ventricular system and in the fibrous sheaths of the peripheral nerves Meningeal tumours are benign and the last group, neuro fibromata, are genetic in origin and have already been considered But under the term **Glioma** a number of tumours of uncertain origin are included which exhibit varied growth behaviour The commonest is an ***Astrocytoma,*** *an infiltrating tumour of the white matter* which may start at any age It grows slowly and the survival period after local removal is often many years **Glioblastoma** is less common It starts in middle life in the cerebral hemi spheres and is much more malignant, infiltrating rapidly and usually proving inoperable Yet they never metastasize to any other part of the body in the way that a malignant tumour of some other part of the body notably of the lungs, so often metastasizes to the brain A **Medulloblastoma** is a highly malignant tumour usually occurring in children and practically confined to the roof of the fourth ventricle and cerebellum

fever X ray treatment is now useless, and from now onwards, although anti folic acid drugs may induce temporary remission, the overall tendency of the disease is steadily downhill Much less frequently the disease starts in the mediastinal glands or in the abdomen and runs a more rapid course (Abdominal Hodgkin s is always associated with fever) It may even start with infiltration of the skin or present as a spinal tumour due to local involvement of the meninges

Sometimes in a case which is clinically Hodgkin s disease biopsy of a gland fails to reveal the typical histological picture associated with it and the pathologist returns a diagnosis of one of the **Reticuloses,** i e new growths of reticulo endothelial as opposed to that of connective tissue Indeed, Hodgkin s disease itself is a reticulosis These other reticuloses run a more benign course however, although most end as Hodgkin s disease or as **Reticulum celled Sarcoma,** which has certain clinical features which distinguish it from lympho sarcoma In the latter a few cells looking like immature lymphocytes may get into the blood but in reticulum celled sarcoma immature reticulum cells get into it and these are morphologically indistinguishable from monocytes Hence the explanation of so called monocytic leukaemia Further, while lympho sarcoma always starts in glands and often in childhood reticulum celled sarcoma sometimes starts in bone and is a disease of adult life

Sometimes multiple tumours develop in the bones derived from the plasma cells of the bone marrow (which may appear in the blood) eroding their cortex and weakening their structure, the order in which they are most commonly affected being spine ribs, sternum, skull, scapula pelvis, clavicle, humerus and femur In seventy five per cent of cases of this disease, **Myelomatosis,** Bence Jones protein possibly derived from the breakdown of these myelomata, appears in the urine and the amount of globulin in the blood is usually increased The sedimentation rate is also greatly raised The first symptom is usually pain and tenderness in one or more bones followed by rapidly developing deformity, some patients developing bumps on the skull In others a spontaneous fracture or anaemia is the main presenting symptom and sometimes myelomata occur outside the bones, for example, in the kidneys, leading to

New Growth of the Blood forming Tissues

The blood forming tissues, namely those of the bone marrow, lymphatic glands and spleen, are continuously producing new cells in large numbers, in the process of which a primitive cell passes through a number of stages before being discharged into the blood A new growth may start in any of these tissues Further, it may start in cells at different stages of development, i e in primitive, less primitive or almost mature forms There fore any clear cut classification of these growths or diseases of the blood forming organs, as they can be called, is well nigh impossible Rather they form a sort of continuum in which no clear cut dividing lines can be drawn This must be 'carved up somehow, however, for descriptive purposes and the order in which these diseases are described is that likely to make their relationships to each other most apparent

Sometimes the lymphatic glands are found to be enlarging in the neck of a young adult This process started on one side first but has probably spread to the other by the time he is first seen For they are quite painless There is no fever to suggest infection, or any softening to suggest tuberculosis, and the peripheral blood is normal Examination under the micro scope of a section of a gland removed for diagnosis now often reveals the typical picture associated with **Hodgkin's Disease** but whether it should be classified as inflammatory or neoplastic is a matter of some doubt As it runs a progressively fatal course, however, and sometimes occurs in acute malignant form, the practical place to put it would seem to be under neoplasia Further, Hodgkin s glands react to X rays like other forms of new growth Indeed, under this treatment they may disappear, suggesting that a radical cure has been achieved But it is really only palliative After an interval of months or years an X ray of the chest reveals enlarged hilar glands, or the spleen can now be felt due to involvement of its Malpighian corpuscles, or new glands are found in the axillae or felt through the abdominal wall At this stage too, the patient becomes anaemic, although there are no characteristic changes in his blood Further, he usually becomes febrile Sometimes his temperature is completely irregular, sometimes raised each night, occasion ally *of the remitting and relapsing type* known as Pel Ebstein s

cells increases and myeloblastic transformation of reticulo endothelial tissue may also occur elsewhere notably in the spleen, which gets larger and larger, and to a less extent in the liver (Myeloid deposits, i e areas of myeloblastic transformation, may even be found under the skin and periosteum) In consequence the white cell count mounts and may reach half a million per cubic millimetre, partly as the result of an increase in production of normal polymorphonuclear leucocytes and partly as the result of myelocytes gaining access to the circulating blood At the same time the number and haemoglobin content of the red blood corpuscles decline and it is of the symptoms of anaemia that the patient usually comes complaining sometimes of splenic pain or having found his own large spleen The disease tends to run a chronic course and is ultimately fatal

Acute Myeloid Leukaemia is much less common and tends to occur in relatively young people but intermediate types between acute and chronic leukaemia are met, the more primitive myeloblasts tending to occur in the acute and the less primitive myelocytes in the blood of the more chronic cases In acute myeloid leukaemia the onset is sudden with fever and rapidly developing anaemia Sometimes the first symptom is haemorrhage from a mucous membrane The spleen may be just palpable but there is often too little time either for it to enlarge or for the blood count to rise Indeed the white cell count is often low and the diagnosis turns on finding myeloblasts in the blood *Acute myeloblastic leukaemia may also* terminate a long standing chronic benign myeloid state The patient has been getting on fairly well with X ray treatment at intervals for years Then his white cell count drops myeloblasts appear in his blood, his temperature rises and he dies in a few weeks

Chronic Lymphatic Leukaemia is less common than its myeloid cousin and for some reason almost limited to men Further, it tends to run an even more chronic course and is often compatible with a reasonable existence for years without any treatment whatever Again the first symptoms are usually referable to the associated anaemia of the microcytic hypochromic type and the disease is suspected on finding discrete enlargement of lymphatic glands all over the body The

nephritis' The disease, which is slightly more common in men than women, rarely starts before the age of forty and is fatal in about a year

A number of clinical conditions are characterized by the over production of blood corpuscles and the appearance of primitive cells in the blood These must also be regarded as neoplastic as this over production is out of all proportion to any conceivable need of the body as a whole, contrasting with the leucocytosis and lymphocytosis of infection and the polycythaemia of low oxygen pressure They differ from other forms of neoplasia, however, in that, while the latter may be the result of abnormal behaviour of a small group of cells (or even of a single cell), these are due to over production of cells by certain tissues throughout the body But, just as new growth can be benign or malignant, so these conditions can also run a chronic benign or rapidly malignant course Further, just as a benign tumour can become malignant, so chronic benign over production of corpuscles can flare up into an acute malignant condition

Sometimes the red bone marrow grows down the shafts of the long bones leading to over production of red cells, **Primary Polycythaemia** (Osler-Vaquez disease) The first symptoms are usually due to the increase in the volume and red cell content of the circulating blood (which may contain as many as ten million red corpuscles per cubic millimetre) namely headache, nervousness, poor peripheral circulation and vertigo The face becomes red, the conjunctivae congested and the eyes blood shot while the liver and spleen are usually both enlarged due to congestion, the latter often containing numerous infarcted areas The main risk is thrombosis in some important part of the body, notably the brain Apart from that the disease runs a chronic and very benign course, responding to treatment with radioactive phosphorus which is taken up specifically by the cells of bone marrow In some cases the bone marrow gives out eventually and the patient develops aplastic anaemia In others myeloblastic transformation of the bone marrow leads them to die slowly or quickly of chronic or acute leukaemia

In Chronic Myeloid Leukaemia the production of myeloid

A cell is not the static structure which it appears to be, when stained and fixed, under the high power of the microscope, but a cauldron of chemical activity resulting at first in growth and ultimately in the performance of some particular chemical function Growth is concerned with the elaboration of protein mainly of the type known as nucleoprotein, function with chemical transformation and the formation of certain substances necessary to the life of the body as a whole Both these forms of chemical activity are regulated by enzymes, and these are now believed to be large single self perpetuating molecules of protein identical in their general nature both with the genes in the chromosomes of all nuclei and with the viruses which wander at large in animal tissues and are the specific causes of many human diseases Now some cells in the body, for example *those of the skin, the bone marrow and the lymphatic glands,* continue dividing and reproducing continuously throughout life It is evidently their job Most stop soon after development is complete and then under gene enzyme direction transfer their energy to some form of particular chemical production in relation to the requirements of the body as a whole Under the chemical stimulus of physical injury (which liberates histamine), however, they can start reproducing again repair ing damage done Really highly specialized normal cells never regain this power

When a cell becomes malignant however specialized it has *become, not only does it start to divide but it starts proliferating* abnormally growing regardless of the general rules of growth Further, this extraordinary alteration in its habits seems to be associated with and is presumably due to, a fundamental change in its chemical *way* of life It now needs less oxygen and produces less carbon dioxide Indeed, like a tetanus or botulinus bacillus it is living largely anaerobically So blood supply no longer matters to it much But what causes this extraordinary change? Presumably some abrupt alteration in the gene enzyme machinery which dictates its way of life

A large number of factors are almost certainly involved One would appear to be genetic predisposition In breeding can bring out, not only susceptibility to malignant growth in general, but also organ susceptibility i e susceptibility to cancer of different types A race of mice can be produced al of

diagnosis is confirmed by the blood count which again reveals vast numbers of white cells reaching perhaps to half a million but, this time, almost all lymphocytes

Acute Lymphatic Leukaemia is very rare and runs much the same clinical course as acute myeloid leukaemia Lymphatic glands are seldom enlarged and the diagnosis turns entirely on the blood picture but the lymphocytes in it are so primitive that it is often difficult to distinguish them from the abnormal white cells found in the blood in reticulum celled sarcoma and lymphosarcoma Further, the distinction between primitive lymphocytes and myeloblasts is also difficult and some haematologists maintain that no such disease as acute lymphatic leukaemia exists or that the two diseases are identical, which amounts to saying much the same thing

The Cause of New Growth

New growth is of many types, and it is exceedingly improbable that there is one single cause for it Teratomata and complex tumours like angiomata are developmental abnormalities The cause of other benign tumours remains even more obscure Maybe they are due to the late development of cells left behind in the normal stream of development But that is speculation Really we have no idea why so many people develop a lipoma or fibroma somewhere under their skin or are found on the post mortem table to harbour an adenoma in the kidney or an unsuspected leiomyoma in the uterus The cause of the benign but functionally devastating tumours of the anterior lobe of pituitary the thyroid and parathyroid glands, and the suprarenal cortex and medulla, also remains enshrouded in mystery

Malignant growth has been intensely studied It can now be started experimentally and maintained indefinitely by passage from animal to animal Much has also been found out about the metabolic habits of its cells Further a number of clinical facts about malignant growth of different kinds have been collected and, although we are nowhere near being able to claim that we have discovered the cause of cancer ' we do now know something about its nature and possess some sort of inkling although we can say no more than that of the sort of conditions under which it is likely to develop

possible, then, that spontaneous carcinoma in man is started by chemical carcinogens in his food or in the air he breathes? The overall incidence of carcinoma is increasing in modern industrialized society and is greater in towns than in country districts Further cigarette smoking seems to predispose to cancer of the lung but it is clearly not the only factor because it sometimes occurs in men who have never smoked and remains much less common in women although cigarette smoking is rapidly becoming almost equally a woman s habit

Viruses are responsible for certain tumours in animals mainly in birds These usually start in tissue of mesodermal origin and can be transmitted from one animal or bird to another by cell free extracts Further, lymphatic leukaemia in fowls would appear to be a virus disease and in mice a factor in their milk now believed to be a virus seems to predispose young mice to develop cancer in adult life Now a virus is a self-perpetuating molecule of nucleoprotein, like a gene, but capable of wandering at large in the animal body and causing disease Further, a gene can augment modify or neutralize the action of another Therefore a virus getting inside the nucleus of a cell might supersede the control of it by its own genes and profoundly modify its way of chemical life So if this virus were transmitted at every cell division to each new daughter cell, this gross perversion of normal government might be perpetuated down the generations

This is an attractive theory and many well established facts now appear to come into line with it A virus produces one variety of tumour only, usually of the mesodermal type A chemical carcinogen can start malignant growth in tissue of any kind and can produce sarcoma or carcinoma A virus multiplies in the growth which it produces being transmitted at least so it appears to both daughter cells at every cell division and, if it could be killed a sarcoma of this kind would cease to grow A chemical carcinogen starts a growth and then ceases to act repeated application of it now being quite unnecessary So it looks as if a chemical carcinogen mutates the genes while a virus merely modifies their action If this view is correct, to cure carcinoma it is necessary to mutate the gene back to normality to cure sarcoma, to discover some way of inhibiting the action of the virus Finally, it is an interesting fact, which

which die of spontaneous cancer of the breast, and there are recorded human families in which cancer appears in every generation Indeed, there are some in which it seems certain that every member will die of it if he or she escapes all other risks and so lives long enough Further, congenital polyposis of the colon is known to be inherited, and all untreated cases develop cancer eventually

Age is certainly a factor Advancing age, with the exception of a small group of malignant tumours known to be congenital, predisposes to carcinoma Sarcoma and the acute leukaemias tend to occur in younger people Nevertheless, fifty per cent of all malignant tumours occur in people over sixty Sex has also some significance Cancer of the lung, for example, is far more common in men On the other hand, the overall incidence of cancer in both sexes is more or less the same

Chronic irritation has long been blamed for cancer, for example, smoking a clay pipe, a rapidly declining habit, for epithelioma of the lip the friction engendered by a carious tooth for epithelioma of the tongue Bilharzia infection is known to be associated with carcinoma of the bladder, and the patient with osteo sarcoma often gives a history of recent trauma X rays and radium are known to cause mutation in insects and experimental animals An X ray burn frequently leads to cancer of the skin Over exposure to any form of ionizing radiation may lead to leukaemia It is on record that some of the girls engaged in painting the dials of clocks with luminous radioactive paint, and who pointed their brushes between their lips, subsequently developed sarcoma of their bones

Certain chemical substances can also do it Chimney sweeps and men who work with tar have long been known to be prone to epithelioma of the skin But only comparatively recently, following up these observations has it been established that *certain hydrocarbons, notably dibenzyl anthracene, are specific carcinogens* That is to say, painted on the skin, they lead, after a latent period of some days or weeks, to carcinoma and, injected deep to carcinoma or sarcoma, according to the *particular tissue in which* they are landed Further, experimental malignant growth thus started can be kept going indefinitely by transplantation from animal to animal Is it

THE INEVITABLE AGEING PROCESS

As age advances the body begins to wear out for no other apparent reason than the passage of time and the stress and strain of human existence The hair turns grey The skin loses its elasticity and becomes wrinkled adding character to the ageing face An arcus senilis develops round the iris Degeneration in the lens (cataract) may lead to failing vision, in the internal and middle ear (otosclerosis) to increasing deafness Other symptoms are due to changes in the arteries lungs and nervous system

Arteriosclerosis

A degenerative process, atheroma starts sooner or later in the intima of the arteries In some places the intima swells with deposition of cholesterol obstructing the flow of blood through a small, but seldom through a large vessel In others its epithelium gives way leading to a rough surface over which blood may clot blocking the flow through that artery completely Medial (Monckeberg s) degeneration is less common Muscle and elastic tissue are replaced by fibrous tissue and sometimes infiltrated by deposits of calcium salts In extreme arteriosclerosis, i e degeneration of intima *and* media the muscular smooth lined artery has been converted into a rigid tube incapable of adapting its lumen to meet the blood requirements of the organ it supplies

If the main arteries are affected a rather higher pressure of blood must be maintained by the heart For the onward movement of blood during diastole is effected by the diastolic pressure and this depends on the degree of distension of the large muscular and elastic arteries during systole So when they start to degenerate and to loose their elasticity a higher systolic pressure must be maintained to keep up the same diastolic pressure and the diastolic pressure may also rise a little to compensate for some slight increase in the resistance to the flow of blood through the arteries Clearly the primary trouble in these cases is the loss of elasticity of the arteries and the increased resistance which they offer due to arteriosclerotic change The high blood pressure is the heart s effort to maintain the circulation

fits in with the virus theory of the origin of some sarcomata, that, while chemical carcinogens are active in all animals, viruses which cause malignant disease, like the viruses which cause infection, are in general specific for a single species only

Endocrine secretion clearly plays some part in the development and maintenance of certain types of human carcinoma Castration in the male or the administration of oestrogenic substances, which inhibit the internal secretion of the testes (physiological castration), will inhibit neoplastic change in the prostate and even cause secondaries in glands and bones to fade away To a less extent oophorectomy or administration of testosterone inhibits the rate of growth of carcinoma of the breast in women before the menopause, after it stilboestrol has much the same effect True that we have no convincing evidence that other types of growth are influenced by any of the known human hormones, but oestrogenic substances and testosterone are both clearly related to phenanthracene, one of the most potent of the chemical carcinogens, and it seems likely that the increasing tendency to carcinoma in advancing age may well be associated with a changing endocrine pattern of the body

What view then, are we to take today of the nature and most probable causes of malignant growth in Man? Carcinoma seems likely to be due to sudden mutation of the genetic structure of a single cell or of a small group of cells with the result that they revert to rapid growth which the normal growth co ordinating machinery of the body seems powerless to control But why this sudden mutation? That question we cannot answer yet All that we can say is that the stage for it seems to be set when genetic predisposition advancing age the change of endocrine pattern associated with it and the prolonged action of a carcinogen in food or atmosphere have conspired to produce the right conditions Sarcoma, on the other hand, looks more like virus infection superseding good cell government and perverting normal growth behaviour Nevertheless, sarcoma and carcinoma both possess in common the extraordinary habit of infiltration and metastasis This phenomenon medical science is completely unable to explain at present

a man in this state might have been expected to break down with breathlessness, as in acute left ventricular failure As a matter of fact, pain usually dominates the clinical scene, pain of a curiously arresting and constricting type, **Angina of Effort** starting over his sternum and radiating down the inner side of his left arm, sometimes down both his arms and into the inner fingers of his hands Every time he attempts a rate of work demanding a cardiac output which his coronary arteries cannot permit, he is now pulled up by the same pain and compelled to stop and stand Then it quickly passes off only to return with almost mechanical regularity whenever he attempts to walk up the same hill or the same flight of stairs at the same rate as before So he soon learns to lead his life in rather lower gear

Anginal pain stops a man with atheromatous coronary arteries attempting a rate of work which would do him serious harm He is pulled up by pain before his heart muscle is dangerously short of oxygen and before he himself is acutely short of breath Anginal pain like all pain is protective in nature But exactly how myocardial ischaemia produces it is not clear, indeed no clearer than how lack of food produces hunger or lack of water thirst Pain of this kind, however, always tends to come on when anything interferes with the blood supply of working muscle although the distribution of anginal pain is so curious that many patients never associate it with their hearts For visceral pain is felt not in the organ whence it is coming which is insensitive to all ordinary stimuli but in the skin and muscle of the body anatomically and developmentally related to it And the heart is derived from the same primitive segments as the inner side of the arm and the wall of the upper chest

Similar and sometimes very severe pain coming on suddenly at rest is almost always due to the blood supply of part of the muscle of the heart having been suddenly cut off **Cardiac Infarction,** by some pathological process operating in a main coronary artery or in one of its larger branches Either the intima has suddenly swelled up obliterating the channel or that has suddenly been blocked by blood clotting over an atheromatous ulcer The functional consequences are the same in

Arteriosclerosis is not, however, the cause of serious high blood pressure All the evidence points to it being caused, in the first instance at any rate (page 187), by constriction of the muscle of the middle coats of the smallest arteries all over the body (vaso spasm) necessitating a much higher systolic and diastolic pressure to maintain the circulation Nevertheless systemic hypertension undoubtedly aggravates the structural changes in arteries which are the inevitable consequence of the ageing process and starts sooner in some people than in others So in practice high blood pressure, necessitated by vaso spasm, and arteriosclerosis, due to advancing age with or without a little compensatory rise of pressure, although they are distinct conditions, often coexist

Now arteriosclerosis, whether resulting purely from advancing age or accelerated by high blood pressure, is for some reason essentially a patchy process Some arteries are much and others little affected, and those most affected in one patient may almost escape in another Sometimes the large ones get it most, and in the really large arteries, the aorta, common iliacs and subclavians, it often matters very little indeed They are so wide that there is usually plenty of room for the blood to get past Even in an artery as small as the brachial, although patches of atheroma in its intima and areas of fibrosis and calcification in its media may make it feel hard, irregular and tortuous, the blood succeeds in reaching the lower arm and hand In fact it is only in the small and smallest arteries, the coronary, tibial, renal, cerebral and retinal arteries and their branches, that arteriosclerosis commonly causes serious trouble, the main brunt of it falling on the coronary arteries in one man, on the tibial in another, on the cerebral in a third and so on Further, usually more extensive in men than in women, it starts in one man much sooner than in another Hence the saying, A man is as old as his arteries '

When the brunt of advancing atheroma falls on the coronary arteries one or both get narrow with the result that, although they may still be able to carry enough blood per minute to supply the heart when the body is at rest, they cannot carry enough to enable it to increase its output sufficiently when it is at work In these circumstances the heart becomes relatively ischaemic, i e short of blood in respect of its requirements, and

it is impossible to prophesy the outcome in an individual case of angina either of the heart or legs

When the circulation to the legs fails still further, they begin to feel cold Held up above the level of the body they now turn white blood cannot get to them against gravity through their narrowing arteries Allowed to hang down they become blue and congested venous blood quickly runs back into them with gravity in the face of so little opposition from behind Often one or more toes become infected round the nail bed, poor blood supply always predisposing to infection Then one day one turns dark, dusky blue Clearly blood has clotted in the arteries supplying it Slowly it turns black as the tissues die but, if kept clean and dry, it will usually separate in effect gradually amputate its now unwanted self But other toes may go the same way or **Senile Gangrene** begin to involve the whole foot and spread rapidly up the leg

Sometimes the main incidence of arteriosclerosis is on the cerebral arteries but, as the blood supply of the brain bears no appreciable relation to mental work, there are seldom any warning symptoms nothing comparable at any rate to angina of effort which so often precedes cardiac infarction, or to intermittent claudication which so often precedes senile gangrene True that transient slight attacks may occur but more often, without any previous warning, a patient suddenly has a stroke, the lay term which has come to be applied to the abrupt loss of consciousness which results from any vascular accident in the brain The blood supply to part of it may have been suddenly cut off by **Cerebral Thrombosis** Alternatively an artery may have ruptured **Cerebral Haemorrhage,** the ones most likely to give way also being those most likely to get blocked by clot namely the branches of the middle cerebral Why the branches of this artery are more liable to arteriosclerotic change than any others in the brain is far from clear It is odd, too that vessels seldom rupture in any other part of the body Spontaneous haemorrhage appears to be almost a cerebral *monopoly*

In general cerebral haemorrhage is more sudden and dramatic than cerebral thrombosis and the level of loss of consciousness deeper Instead of slowly lapsing into a semi conscious state, a man crumples up, falling to the ground This

either case Blood in the artery stops moving and thus the myocardium beyond is rendered ischaemic, looking, on the post mortem table (if the patient dies), correspondingly bloodless and pale The actual moment of the attack is, as might be expected, much the most dangerous When a main coronary artery is involved, the blood pressure slumps and death is almost instantaneous (Cardiac infarction is the commonest cause of sudden death) If only a branch of it is affected, the rest of the heart, aided by compensatory vaso constriction, can usually maintain a sufficient blood pressure and, although it may fall a little, the patient survives With analgesics and rest pain passes off and most men (cardiac infarction is far less common in women) admitted to hospital in point of fact live to leave it Some muscle, however, has now been gradually replaced by fibrous tissue So a man who has had a cardiac infarct is likely on getting up out of bed to find himself short of breath on exertion, on account of permanent damage done to his myocardium, or to begin to complain of angina of effort due to permanent narrowing of one of his coronary arteries (If he had angina before, he is likely to get it on still less exertion now) Further, he is always liable to another infarct Nevertheless, clinical experience rather than reason teaches that there is no necessity to be too gloomy in prognosis A man may live ten years or more after an attack

When arteriosclerosis in a man's tibial precedes that in his coronary arteries, muscular exertion is limited by pain in his legs, **Angina Cruris,** rather than by angina pectoris For the narrowed tibial arteries, which can carry enough blood to the muscles of his lower leg for sitting still or walking slowly on the level, cannot carry enough for walking fast or going up a hill So he is pulled up by the same kind of arresting cramp like pain, this time in his calf muscles of one or both legs But again the pain quickly fades away So he goes on until it stops him again, and so on, until experience has taught him to walk more slowly But again prognosis need not be too gloomy Many of these patients improve suggesting that atheromatous swelling must sometimes subside, letting the blood pass more freely Further, graded exercises encourage other vessels to dilate and carry more blood, allowing a full supply to get round to the one time ischaemic muscles by some new and better route Nevertheless,

develop) a man who has had a stroke, instead of having to wear a mechanical support, like a patient with an old polio leg, can swing his spastic leg forward from his hip and then use it as a rigid support while he takes a step forward with his sound one Similarly, he can use his paralysed arm for eating He can stick his spoon between the rigid clenched up fingers of his hand and his arm being spastic in flexion feed himself by movement at the shoulder

Why do some people get thrombosis and others haemorrhage? That depends on two factors the state of their cerebral arteries and the general level of their systemic blood pressure Narrow rough arteries must favour thrombosis wide eroded ones haemorrhage A high blood pressure must favour haemorrhage, a low one thrombosis Cerebral haemorrhage is particularly likely when arterial spasm all over the body is necessitating a high systemic pressure which in turn is accelerating the inevitable degenerative processes of advancing age

Emphysema

As age advances and again to a greater extent in men than in women and also to a greater extent in some men than in others the lungs tend to wear out Their elastic tissue on which their natural tendency to collapse depends gradually starts to give and the zero position of the chest i e that at the end of expiration rises in the inspiratory direction Inspiration now starts handicapped and expiration instead of being passive recoil becomes a muscular act Therefore not only does vital capacity decline but breathing becomes mechanically embarrassed and the patient has increasing difficulty in effecting sufficient pulmonary ventilation to meet his respiratory requirements So he becomes more and more short of breath on exertion Further, his chest gets rigid and the ribs fixed at their joints although it is often difficult to be certain whether his emphysema came first and then his chest got rigid or whether changes in his costo-vertebral joints predisposed to emphysema Further, emphysematous people tend to get bronchitis and bronchitis always aggravates emphysema For inflammation of the bronchial mucous membrane results in obstruction of free flow of air into and out of the alveoli In consequence,

is not difficult to understand In thrombosis, an artery is merely blocked In haemorrhage, blood pours out, destroying brain substance and raising intracranial pressure Indeed, a severe cerebral haemorrhage, like a big cardiac infarct, can be quickly fatal But in most cases haemorrhage ceases as intra cranial pressure rises and the latter is gradually readjusted so that the patient recovers consciousness, although he is inevitably left paralysed, to an extent dependent on the site and size of the haemorrhage In many cases the blood supply to all the upper motor neurones descending from the motor cortex on one side has been cut off, leading to paralysis of the whole of the opposite side of the body (hemiplegia) In others only those to one limb, the opposite arm or leg, are affected (monoplegia) In either case if the right arm is affected and the patient right handed speech is likely to suffer because the upper motor neurones governing it start in close proximity in the left cerebral cortex to those that move the right hand When the lesion is in the cortex the speech centre alone may be affected leading to aphasia Words can be uttered normally, as the motor machinery for their execution has been left intact, but the patient cannot find the right ones to express his thoughts So he speaks an unintelligible jargon Nor may he be able to understand the meaning of the words he hears (auditory aphasia) or those which he reads (visual aphasia) So a small thrombosis in the speech centre (Broca's area) can cut a man off from all communication with his fellows

Nevertheless, the paralysis left behind in the wake of a cerebral vascular accident is far less devastating in its functional consequences than might have been expected The partial contraction of certain muscles which determines position (as opposed to movement) depends, not on impulses descending from the motor cortex, but on impulses which start at a lower level and are normally inhibited by impulses from the cortex These usually escape in vascular lesions of the brain So although the paralysed muscles are flaccid at first, they gradually become spastic and hold the patient s limbs in their natural positions *His leg is extended and his arm flexed* and when the former is forcibly flexed and the latter is pulled out straight both, on being let go, spring back into their natural positions So in due course (spasticity may take months to

particularly liable to develop osteo-arthritis in the other Women are particularly liable to a low grade form of osteo arthritis of the knees at the menopause

The degenerative process starts in the articular cartilage which becomes rough and is then slowly worn away until bone actually meets bone Meanwhile the articular surface of the joint extends laterally leading to characteristic lipping in an X ray picture and the formation of bony outgrowths from the joint known as osteophytes At the same time the synovial membrane becomes chronically inflamed This helps to make the joint look big and is the cause of the crepitus so frequently heard on attempting to manipulate an osteo arthritic joint

The patient s symptoms depend on the particular joint affected If a hip or knee, pain on standing then limitation of *movements are the cardinal symptoms Indeed an osteo* arthritic joint can become completely fixed but this is due to locking by lipping and osteophyte formation never to bony or even to fibrous ankylosis as in rheumatoid arthritis Osteo arthritis of the spine sometimes known as osteo arthritic spondylosis or **Spondylitis Deformans** (on no account to be confused with ankylosing spondylitis (page 172) the pathology of which is entirely different) is very common, less localized and cannot be attributed to weight bearing so readily In the lumbar region it is often found on X ray examination as an almost symptomless condition but it is one of the causes of lumbar pain (lumbago) and sciatic pain (sciatica) due to pressure on the roots of the sacral nerves as they emerge from the spinal canal Sometimes, for no apparent reason osteo arthritic changes develop in the cervical vertebrae giving rise to the condition known as **Cervical Spondylosis** The patient now complains of stiffness and pain on movement of his neck Other symptoms depend on the particular spinal roots affected Occurring high it may lead to referred pain over the back of the head if C4 is affected, to pain and paraesthesiae over a shoulder, if C5 to C8 pain down one arm Indeed cervical spondylosis like a dis placed disc and a spinal tumour is a possible cause of brachial neuralgia Further cervical spondylosis may cause spinal cord compression leading to bilateral, pyramidal dysfunction manifest as some weakness of both legs with increased tendon jerks and up going plantar responses Hence the explanation

to get air into them an increased negative pressure must be maintained during inspiration and an increased positive pressure during expiration to get it out again Both these factors tend to break down the walls of the alveoli

This is only the first stage in a progressive process however Before long two other factors complicate the situation In the first place, as the elastic tissue in the lungs degenerates, the walls of the alveoli (in which the capillaries run) start breaking down So the internal surface of the lungs begins to decrease and this soon begins to interfere with the exchange of oxygen and carbon dioxide between blood and atmosphere, particularly when the demand for it is increased on physical exertion Carbon dioxide now diffuses out less quickly, stimulating respiratory effort which lungs so handicapped may have difficulty in meeting, leading to increasing shortness of breath Oxygen also diffuses in less quickly with the result that the venous blood returning to the lungs may no longer get adequately saturated in the time available In the second place, as the alveolar walls rupture, the total capillary bed available for the passage of blood through the lungs is reduced and the same amount of blood must now flow through a smaller number of capillaries in the same time So it must flow faster Therefore the right ventricle must maintain a higher blood pressure in the pulmonary artery in consequence of which it becomes hypertrophied and is soon working flat out,' even when the body is at rest Add to this bronchial infection, and breakdown leading to congestive failure is inevitable

Osteo arthritis

With advancing age the joints also develop degenerative change Again this is a patchy process, one joint being affected much more than the others in the same person, not infrequently one joint alone, and different joints in different people On the whole, however, it is the weight bearing joints which are most affected, the hips and knees, but quite often a hip or knee on one side only suggesting inborn predisposition to succumb Physical injury, overweight and heavy work predispose to it and, as would be expected, any congenital or acquired deformity which throws a particular strain on one side of the body Thus it is that a man, lame most of his life in one leg, is

women being affected more frequently than men (This is the converse of the sex incidence of arteriosclerotic or senile dementia) The symptoms are much the same in both types, modified however as would be expected, by the part of the brain particularly affected The patient becomes dull and unresponsive Intellect deteriorates and initiative declines He begins to behave stupidly, stealing lying, or ' making a fool of himself, for ever repeating the same words and phrases Later memory deteriorates but there is little disorder of affect, i e of emotional reaction

Mental failure at a more advanced age is more likely to be secondary to failing blood supply to the brain **Arteriosclerotic Dementia** Character sometimes deteriorates, and the patient s emotional state may fluctuate as in Shakespeare s King Lear At one moment we see him in a mood of ill timed generosity giving all away, a little later in a rage passing judgement on his favourite daughter But the body on which the mind is based often remains strong Lear s physical strength showed no signs of failing when he was wandering on the moor and on the edge of the cliff he remained, decked out with flowers, Every inch a King

The Climacteric

In all women somewhere between the ages of 45 and 50 the anterior lobe of the pituitary, although it continues to secrete the follicle stimulating hormone, begins to fail to secrete the luteinizing one with the result that the sexual cycle ceases Menstruation, after a period of increasing irregularity now stops altogether, **The Menopause,** although both ovaries still contain follicles potentially capable of maturation At the same time the adrenal cortex hypertrophies and thyroid secretion may decline In short the pattern of endocrine secretion in the body changes In some women cessation of menstruation is its only sign Others suffer to varying degrees from symptoms of a physical and/or mental kind Vaso motor instability is common the patient complaining of repeated hot flushes mainly round the face and neck Some put on weight others grow hair on the face, a manifestation of increased adrenocortical activity Many get depressed anxious or emotionally unstable, depend ing largely on their personality, but in a year or two the body

of the condition once known as lateral sclerosis of the spinal cord

Cerebral Degeneration

Sometimes the nervous system wears out prematurely, although its blood supply, as far as can be seen, remains intact and the patient is not old by any ordinary standards Further, atrophy can be demonstrated in certain parts of it after death, although the arteries which supply them may look more or less normal For example, it occurs not infrequently in the nerve cells of the basal ganglia, which exert their influence on voluntary movement through the extra pyramidal motor system, leading to a condition known as **Paralysis Agitans,** after its symptoms, or sometimes as senile Parkinsonism, after James Parkinson, who described it in 1817 This condition, which is far more common in men than in women, is characterized by stiffness and rigidity of the muscles, leading to retardation of all voluntary movement, and by tremor, most marked when the patient is sitting still and disappearing characteristically when he attempts to do anything So voluntary movement becomes increasingly difficult When compelled to move, he hurries forward, with spine bent and knees flexed, in little shuffling steps, as if chasing his own centre of gravity Then, whatever it may be more or less successfully accomplished, he sits again hour after hour with blank expressionless face, pill rolling ' with his fingers and often with his heels tapping on the ground because of the tremor in his feet As the disease advances, facial expression becomes more and more affected with the result that it may now be hard to assess the patient's state of mind

In other cases the main incidence of the atrophy is on the frontal lobes leading to **Presenile Dementia** The mind starts to regress at a relatively early age, and examination of the brain after death reveals changes out of all proportion to those in the arteries keeping it supplied with blood **In Pick's Disease** the frontal or temporal lobes or both are atrophied In **Alzheimer's Disease** plaques of degeneration are scattered through the brain Both these types of primary cerebral degeneration tend to come on between the ages of forty and sixty, often occurring in several generations of the same family,

philosophy or religion must be invoked 'to hold the fort So weakness of character may now find a man or woman out

The psychoneurotic who has always had difficulty in adapting himself to the problems of life is now likely to have particular difficulty in adapting himself to that of growing old He becomes increasingly nervous, each new symptom heralding in his over active imagination the onset of his last disease In short he continues to suffer still from his life long lack of mental self discipline Another constitutionally different and from his own point of view more fortunate deprived of the emotional outlets of his younger days, still obtains that which his nature demands by excessive preoccupation with the real or imaginary failing health of his body This, hysterical hypochondriasis is yet another form of subconscious self indulgence Such a man relatively happy in himself, becomes a source of irritation and contempt to others

The *potential psychotic is liable to some more serious form* of mental breakdown Just as the schizophrenic fails to adapt himself to widening experience and increasing responsibility so the ageing man may fail to adapt himself to the problem created by narrowing experience and diminishing responsibility and lapse into a state of **Involutional Melancholia** He becomes peevish and irritable, loses affection even for his own children and tends to lead a solitary life He becomes depressed his life has been a failure a succession of mistakes He has made a hash of everything Then his intellect may start to fail, delusions adding misery to true memory Another, more lucky, escapes into an unreal happier world born of his own imagination But, as would be expected in involutional mental disorder psychoneurosis and psychosis meet and may be complicated by dementia due to primary atrophy or arteriosclerosis of the underlying brain Thus the pathogenesis of the ageing mind may be exceedingly complex

Most people the structure of their brains permitting grow old with better grace They neither lose their nerve nor revolt against nor consciously or unconsciously attempt to escape from the realities of it They continue to make the best of life as they find it and face the advent of death fortified if not by religious faith, by some philosophy which they have built up for them selves as the result of their experience of living True that they

settles down in new gear and most women succeed in readjusting themselves emotionally to continued experience of life But the menopause in women is the age at which organic disease frequently starts, notably hypertension, diabetes mellitus, rheumatoid arthritis, thyrotoxicosis and psychotic breakdown

The male climacteric is more gradual Further, it occurs later in life and, apart from a gradual decrease in sexual function and instinct, is not associated with any characteristic symptoms, except perhaps increasing frequency of micturition due to **Prostatic Enlargement** which results from adenomatous change in the gland as age advances Further, not infrequently a local adenoma (page 263) may start to offer resistance to the passage of urine resulting sooner or later in some degree of retention with overflow The bladder now never empties completely after each act of micturition and gradually becomes dilated and hypertrophied, sometimes remaining palpable above the symphysis pubis after the patient has passed urine Under these circumstances one of two things is bound to happen sooner or later He may suddenly get acute retention of urine Or his urinary tract becomes infected, usually by *B coli* or *Strep faecalis*, and the combination of this and back pressure on his kidneys leads to bilateral infected hydronephrosis and progressive failure of renal function

In some patients adenomatous change in the ageing prostate becomes carcinomatous Indeed, it would appear that if a man lives long enough he is bound to get carcinoma of the prostate with its peculiar tendency to metastasize to bone (page 218) On the other hand the malignancy of it seems to be inversely proportional to the patient s age

Involution

As age advances the past lengthens out behind and the future, to which a man can reasonably look forward, dwindles with the result that he comes to live more and more in the past and less and less in anticipation of anything that life may still hold in store Further, there is progressively less and less for which to go on living Friends die, physical infirmities add up, and the ageing man or woman, even those surrounded by a grown up family, comes to live in an environment which the younger generation cannot understand and in which memory,

PART IV

Clinical Diagnosis

Sometimes a person has been seriously injured or found acutely ill, unconscious or in some odd mental state, but most people seek medical advice of their own accord. They want a routine medical examination or complain of symptoms that lead them to suppose that they must or may be ill. One has experienced some abnormal sensation, another noticed some departure from the normal working of his body, a third found some odd change in its structure. Nevertheless it requires different degrees of provocation to get different people to seek medical advice. Some 'rush off' to the doctor on the least suggestion of 'anything wrong'. Others wait expecting or hoping that their symptoms will remit or until they can 'screw up their courage to come'.*

The doctor on his side is faced with the problem of diagnosis. What do this patient's symptoms mean in terms of the machinery of his body gone wrong? Further, is some organic pathological process interfering with the structure or function of it and, if so, what pathological process and where is it acting? Or can his symptoms all be explained in terms of some primary functional disorder?

The first thing he does is to take his patient's history, as far as it can be got, from him or any relatives or friends who have come with him. His next step is to examine him by means of the senses with which he is himself endowed, namely, sight, touch, hearing, and this, the clinical examination of the patient, is now often supplemented by taking his blood pressure, looking

* In a hospital clinic most patients have been sent up by doctors for second opinions on diagnosis or for help in their treatment. So the general run of 'clinical material' there is different to that in a general practitioner's surgery.

may not be able to subscribe to the optimism of Robert Browning, "Grow old along with me, the *best* is *yet* to be"* Nevertheless, they react intellectually rather than emotionally to advancing age, realizing that it is better to remain interested in all the seasons of human life than to live out their days in perpetual regret for its lost spring

* Rabbi Ben Ezra.

Investigations do not in fact by any means always reveal the diagnosis automatically, and ill planned or their results misinterpreted, or not considered properly in relation to clinical findings, may lead right away on the wrong diagnostic scent Further, unless a clinical diagnosis has been made, how can the investigations which should be put in train in order to confirm, extend or disprove it or to rule out some less likely but more serious condition, possibly be known?

Clinical diagnosis as opposed to that by X ray or laboratory investigation will *alone* be considered in this chapter For *the* problem which again and again confronts both general practitioner and physician is whether it is *really* necessary to investigate a patient and, if it is necessary how to begin? Before that can be decided a clinical diagnosis *and* an estimate of the chances of it being right are both absolutely essential

In some cases the diagnosis is obvious and becomes so more and more often with increasing experience No thinking is necessary Rather it springs to mind through the eyes, ears or fingers at once In others a short history and a rapid examination will settle it with a reasonable degree of certainty More difficult cases demand as accurate a history as can be got, as careful and complete an examination as time and circumstances permit and much hard thinking

THE HISTORY

The history is the truth (in so far as that can ever be ascertained) as to the evolution and nature of the patient s symptoms in relation to possibly relevant events in his life such as change of occupation accidents, exposure to infection It also includes the formation in the doctor s mind of some concept of his physical social and emotional environment as determined by his work family friends hopes, fears and disappointments So contrary to what is sometimes supposed it is not merely or necessarily just what the patient says which even after careful and extensive questioning on these lines, may still be far from the truth For example although a patient usually opens out by giving some reason why he has come for medical advice he may conceal his real one, being far too afraid to blurt that out at once Or he is a naturally bad witness and cannot

at the fundus of his eye and testing his urine This done, it usually proves possible to interpret what he said and what is found on examining him in terms of disorder of function and alteration of structure and surmise the pathological process most likely to be responsible for them *with reasonable certainty* This is the *clinical diagnosis,* and in most cases, certainly in general practice, it is sufficiently likely to be right to be a safe basis for immediate therapeutic action

In other cases, and in some apparently fairly obvious ones" *in which it might be something more serious it is, however,* clearly necessary to extend a purely clinical diagnosis by the use of one or more of the other methods of examining a patient which are now available These are usually referred to as investigations It may be necessary, for example, to throw a shadow of a part of his body on a fluorescent screen (and take photographs) with or without the prior administration or injection of some radio opaque substance to silhouette a cavity, to demonstrate vitamin deficiency or detect a poison chemically, to isolate the organism responsible for an infection, to count the corpuscles and estimate the haemoglobin in his blood *to* estimate the concentration of certain substances in it or in his cerebro spinal fluid to examine the microscopic structure of a gland or tissue removed at a biopsy to estimate the efficiency of his kidneys, lungs or liver, to record the electrical changes in his heart or brain even to pass a catheter down one of his veins into the chambers of his heart Indeed the possible investigations to which a patient can be subjected are now legion and still steadily increasing Further, there is no absolute dividing line between the clinical examination and the investigations More and more are certain one time *occasional* investigations creeping into the routine examination of the patient

So the problem which often arises next, i e after some sort of clinical diagnosis has been made is that of whether any investigations are necessary and, if so what ones? *Restraint in* this direction is clearly desirable All take technical time and may lose the patient working hours Many are expensive and cost him or the tax payer money Some are uncomfortable, others not wholly devoid of risk All require skill in their execution many *knowledge and experience in interpretation*

Progressive failure of auditory and visual acuity are common and a patient himself may discover that he cannot distinguish sharp from blunt, appreciate form and shape in three dimensions with his eyes shut or judge temperature at his extremities with the result that he gets into his bath too hot or burns his fingers with his cigarette end Symptoms of this kind, granted that his co-operation can be obtained and he answers truthfully, can be evaluated by the appropriate tests

Secondly, a patient may complain of some abnormal sensation for example, pain (much the most common symptom) tingling, giddiness constriction or a feeling of pressure Symptoms such as these are much more difficult to assess unless they can be elicited by some physical stimulus for example, pain on moving an inflamed limb or applying cold water to a carious tooth giddiness on rotation of the body Far more often they cannot be elicited at will and there may be no particular physical signs associated with them as in the case of an inflamed joint or decaying tooth to help in their assessment Under these circumstances their intensity can only be inferred from the patient s account of them and his behaviour, with the result that the doctor is forced to rely largely on his patient s powers of description and good faith and must be careful not to be led astray by his patient s emotional reactions

Thirdly a patient may have noticed some alteration in the normal behaviour of his body very often some change in one of its rhythmic functions His bowels may have become constipated or loose or he has started passing urine in small or large quantities at frequent intervals In a woman menstruation may have ceased or become more profuse Or he has started regurgitating acid fluid into his mouth or actually vomiting or to suffer from attacks of palpitation sweating and shivering, or from repeated loss of consciousness with or without convulsive movements Or he may have developed a cough and that is of many clinical types ranging from a mere repeated clearing of the throat to the whoop of pertussis Under all these circumstances the doctor is again forced to rely at first on the accuracy of his patient s statements and yet it is often very difficult for him to give an accurate account of what happens In the case of an attack of some kind he may be quite unconscious of the behaviour of his body Then the evidence of an eye witness

remember the order in which or exactly when different events occurred Further, most people have difficulty in describing subjective sensations and many take refuge in vague terms such as giddiness, feelings of pressure, black outs, which are liable to lead the doctor widely astray Nor do patients always speak the truth Few actually malinger, i e invent symptoms deliberately, but many subconsciously exaggerate either out of fear or in the hope of getting more attention, or cannot help understating, foolish though that may be, lest the doctor really finds something seriously wrong with them Further, while one would welcome a good excuse to avoid work or get out of some unpleasant obligation, another is afraid of losing a good job or being put off doing the things he really likes (Therefore, it is often wise to get unbiased evidence from friends or near relations) Indeed, much of a doctor's time is spent in evaluating and sifting evidence and no amount of purely scientific training will help him much in learning that Success in history taking depends on sympathy and understanding, the secret of getting accurate histories depending largely on getting the patient to tell the truth That art develops gradually with age and increasing experience

A symptom is usually defined as something of which the patient complains Thus defined symptoms fall into four categories

A patient may complain of exaggeration or diminution of one of those bodily sensations which are part of everyday experience For example, his appetite may be increased, as in diabetes mellitus, or almost completely lost, as in anorexia nervosa, fever and some cases of carcinoma of the stomach He may be thirsty out of all proportion to the temperature of the weather or the amount of exercise he takes, as in diabetes mellitus and insipidus and in renal failure He may be short of breath on relatively little exertion, on account of disease of his heart or lungs, or feel vaguely tired, ill or out of sorts, or lacking in energy, on account of chronic anaemia, uraemia or low grade fever Symptoms of this kind starting insidiously tend to be ignored Coming on suddenly they are likely to be taken more seriously and so is reduction of any one of those sensations upon which we rely to orientate ourselves in our environment These are immediately recognized as pathological

Progressive failure of auditory and visual acuity are common and a patient himself may discover that he cannot distinguish sharp from blunt, appreciate form and shape in three dimensions with his eyes shut or judge temperature at his extremities with the result that he gets into his bath too hot or burns his fingers with his cigarette end Symptoms of this kind, granted that his co operation can be obtained and he answers truthfully can be evaluated by the appropriate tests

Secondly a patient may complain of some abnormal sensa tion for example, pain (much the most common symptom) tingling giddiness, constriction or a feeling of pressure Symptoms such as these are much more difficult to assess, unless they can be elicited by some physical stimulus, for example *pain on moving an inflamed limb or applying cold water to a* carious tooth giddiness on rotation of the body Far more often they cannot be elicited at will, and there may be no particular physical signs associated with them as in the case of an inflamed joint or decaying tooth, to help in their assessment Under these circumstances their intensity can only be inferred from the patient s account of them and his behaviour with the result that the doctor is forced to rely largely on his patient s powers of description and good faith and must be careful not to be led astray by his patient s emotional reactions

Thirdly a patient may have noticed some alteration in the normal behaviour of his body very often some change in one of its rhythmic functions His bowels may have become consti pated or loose or he has started passing urine in small or large quantities at frequent intervals In a woman menstruation may have ceased or become more profuse Or he has started regurgitating acid fluid into his mouth or actually vomiting, or to suffer from attacks of palpitation, sweating and shivering or from repeated loss of consciousness with or without convul sive movements Or he may have developed a cough, and that is of many clinical types ranging from a mere repeated clearing of the throat to the whoop of pertussis Under all these circum stances the doctor is again forced to rely at first on the accuracy of his patient s statements and yet it is often very difficult for him to give an accurate account of what happens In the case of an attack of some kind he may be quite unconscious of the behaviour of his body Then the evidence of an eye witness

must be obtained or the patient must be taken into hospital for observation or visited repeatedly in his own home

In the fourth place, a patient may have discovered signs of alteration in the structure of his body which, if transient, may have disappeared before he sees his doctor to whom he now endeavours to describe them Oedema, for example, 'comes up' in the evening but has often disappeared by the following morning A salivary gland tends to swell, if its duct is blocked, only at the sight of food or when the patient is hungry, a hernia to disappear when he lies down So a doctor, in order to get at the truth, must be alive to such contingencies and plan his method of examining his patient or his visits to him accordingly Other signs of structural change and functional disturbance are more permanent, for example, jaundice of the skin and urine, swelling of a joint, pain on a certain movement, always there in fact for the patient to show his doctor at any moment, and for the latter, with his technical knowledge and training, to elicit much more accurately

PHYSICAL EXAMINATION

Whence it follows that there is and can be no absolute distinction between symptoms and physical signs, usually defined as objective evidence of alteration of structure or disturbance of function which the doctor finds Rather, many symptoms are elicited on examining the patient, for example, manipulating an inflamed joint or applying local cold to find out which tooth aches, many signs discovered by the patient himself, for example, oedema and swollen glands in the neck (Some signs, for example, jaundice, cyanosis, pallor, loss of weight, delusions, hallucinations, may be first observed by friends) Indeed, the only true symptoms are subjective sensations, such as pain, hunger, tingling, lassitude, and the only true signs those due to structural change or functional disturbance which the patient is unlikely to discover himself, such as a large spleen a murmur in the heart, crepitation at the bases of the lungs Although therefore, taking the history by talking to the patient and examining him, by looking at, feeling and listening to his body, are very different technical methods of approach, both are directed towards finding out the functional disturbance which

is making him feel ill and any structural change which has taken place in his body Further, both often throw light on their pathological cause Therefore, it is a mistake to force history and examination apart and maintain a rigid division between them Far better particularly in a difficult case, to run them in parallel, thinking all the time what both are most likely to mean in terms of functional disturbance and/or structural change and their probable pathological cause

The interpretation of a patient s symptoms often suggests that some particular organ or system is primarily at fault or some fact in his history that he is likely to have succumbed to some particular risk and a pathological process of a certain kind therefore probably active in his body Indeed, when the cause of a disease is known to have been operating, for example he has been starved or exposed to some poison or infection, there is always a high probability that he has developed it Under these circumstances common sense dictates (although it is clearly necessary to keep an open mind) that this organ or that system should be examined with particular care Similarly, the routine examination of the patient sometimes reveals evidence of some disturbance of function or alteration of structure quite unexpected from the history but the nature and cause of which can sometimes be determined by going back and asking the patient certain questions After that armed with this further evidence it may even be wise to return to the physical examina tion No patient can be expected to volunteer *all* the symptom *atic information as to his illness entirely of his own accord* Nor can a doctor always be sure of *all* his physical signs at once In fact only when the interpretation of a patient s symptoms and signs in terms of alteration of structure and disturbance of function *begins* to correspond to those likely to be produced by a known pathological process or by some risk to which he may have succumbed is the clinical diagnosis probably right

Symptoms and signs both point to something having gone wrong in the body mind machinery of the individual man, to produce abnormal subjective sensations at the level affecting consciousness, to produce signs (self discovered or found on examination) at the lower level of structure and function often leaving consciousness completely undisturbed Few are a monopoly of any one alteration of structure or of any one

disturbance of function however Rather most can be produced in many different ways For example, shortness of breath may be due to reduction in the vital capacity of the lungs or to over stimulation of the respiratory centre, oedema to venous or lymphatic obstruction, to general rise of venous pressure, to fall of the osmotic pressure of the plasma, to retention of sodium chloride or to local liberation of histamine Pain can be due to stimulation of nerves by heat, cold or pressure, to vascular congestion to ischaemia of striped or to spasm of plain muscle So the interpretation of symptoms and signs demands knowledge of anatomy and physiology But, if they are considered in conjunction, an elementary knowledge of these subjects will often fit them together in terms of some alteration of structure or some function gone wrong and that interpretation usually proves right But if a mistake is made at this stage, the next step in diagnosis, namely, that of the pathological process responsible for them is bound to go astray

WHAT DISORDER OF FUNCTION?

So we will now proceed to discuss the possible interpretations of some common symptoms and signs We shall begin with disorders of subjective sensation, then consider disorders of bodily behaviour, continue with physical signs of the kind that a patient is likely to discover himself, and finish with those that are only likely to be found by a doctor When this has been done we shall return to the second step in clinical diagnosis, namely, thinking out the pathological process *or* the primary functional disorder most likely to be responsible for the physical signs discovered on examination of the patient and/or the functional disturbance responsible for the symptoms of which he came complaining

Just "Not Feeling Well'

A patient may complain of not feeling really well, not feeling himself, as he may put it, in a way which he cannot describe exactly Clearly there is something wrong with the complex set up of subjective sensations which contributes to that general sense of well being which a man associates with health, but he can describe nothing particular to point to failure or dysfunction

of any part or system of his body Under these circumstances clinical diagnosis (which may be very difficult) turns of necessity on a careful clinical examination and may demand observation in hospital

If his conjunctivae and the palms of his hands are pale, he must be anaemic and under these circumstances it is wise to think in terms of the three ways in which a patient can become anaemic and ask him questions accordingly He may be bleeding internally or from a mucous membrane He may be destroying his blood too fast (A slight degree of jaundice would suggest this) He may not be making his blood sufficiently quickly to make good its normal rate of destruction In the absence of other symptoms or physical signs, however it will be impossible without investigations, including a full examination of his blood to decide in which of these three ways his anaemia is being produced

If his conjunctivae are yellow and his urine contains bile pigment, and he says his stools are pale he must be suffering from jaundice of the intra- or extra hepatic obstructive type (The yellow sub conjunctival fat must not be mistaken for jaundice) His upset of general health is now likely to be due to increase in the concentration of bile salts which runs parallel with that of bile pigment in the blood in jaundice of this type If for any reason he has been vomiting sweating profusely or suffering from diarrhoea, or for some reason his stomach or gut is being kept empty by suction, his body is probably depleted in respect of sodium, potassium or chloride and dehydrated in consequence These conditions will make a patient feel ill out of all proportion to the primary condition from which he is suffering and there are no easily detectable clinical signs by which they can be recognized Chemical analysis of his blood plasma is now therefore necessary to confirm the diagnosis and make the exact electrolyte position clear If his skin is pigmented and there are patches of pigment under the mucous membrane of his mouth and his blood pressure is low, his lassitude may be due to that rare condition adrenocortical failure

Another possible cause of a patient feeling or looking unwell out of proportion to the disease from which he is known to be suffering is uraemia, which like dehydration produces few signs by which it can be recognized clinically So again it is

important to realize the circumstances under which it is likely to occur It should be suspected if his blood pressure is raised, if there is albumin in his urine, if his output of urine is low and whenever there is a history of urinary obstruction and recurrent infection Old people develop uraemia very easily It is for this reason that an attack of pneumonia may render an elderly patient ill out of all proportion to his chest condition

A likely cause of an apparently fit person just not feeling well is always low grade fever It may never rise high enough to make him sweat or shiver but it should be suspected if he has lost weight or if he is at his lowest in the evening, when body temperature tends to rise, and at his best in the morning, when it tends to fall Further, it should be suspected if any signs are discovered to indicate disease of some part of his body in which low grade fever might originate, for example, a murmur in the heart (raising the possibility of subacute bacterial endocarditis) or, much more commonly, the base of one lung (raising the probability of bronchiectasis or a chronic lung abscess) But in many cases of this kind no physical signs can be discovered Then, if low grade fever is still suspected, the patient must be taken into hospital in order to observe how the temperature of his body is behaving

Lastly, just not feeling well may be due to mental staleness born of over work and lack of sleep to worry or anxiety about something definite or to a true anxiety neurosis In these cases talking to him after gaining his confidence will usually reveal the diagnosis Organic disease is out and there is no necessity to start investigations or to take him into hospital to observe the behaviour of his body On the other hand, the differential diagnosis between just not feeling well," due to causes such as these, and 'just not feeling well,' due to early organic disease operating in one of the ways which have been described, may be very difficult and in practice there are many border line cases in which it is hard to decide what course of action should be adopted If the patient seems a reasonably stable and well adjusted person, and particularly if he is over forty (the age at which organic disease often starts), he must be kept under strict observation Further, it must also be remembered that the psychoneurotic person can develop organic disease insidiously, just like any mentally stable person, and it is then that a mistake

can be made so easily For the psychoneurotic patient tends to react to organic symptoms psychoneurotically, clouding the characteristic clinical picture of early organic disease with the result that in an emotionally unstable person it is always liable to be missed Psychoneurotic symptoms coming on for the first time in a person over the age of forty should always be regarded with organic' suspicion

Odd Mental State

A patient may come complaining of symptoms of a mental kind He may say that he can t concentrate or that he is unable to cope ' He may complain of some odd phobia fear of confined or open spaces of buses or undergrounds, of rooms full of people or of being left alone in a certain place Naturally he thinks that he must be going off his head Yet his reason, intellect and memory are all unimpaired his emotional reactions are normal and he has no delusions or hallucinations Symptoms of this kind are due not to any defect in the working of the brain on which his mind is based but to repression of emotional conflict

Another patient is in a highly nervous state His pupils are dilated, his skin moist with sweat the action of his heart forcible and rapid and all his tendon jerks increased The sympathetic division of his autonomic system is clearly in over action but whether this is due to over driving by an emotional state a primary functional disorder, or due to sensitization to normal stimulation by adrenaline on account of over secretion of thyroxine thyrotoxicosis, an organic condition, may be hard to decide In the former talking to the patient usually reveals a psychoneurotic pattern of behaviour in the latter, although he may be worried about something at the moment he is a basically stable and well adjusted person Further, in thyro toxicosis some enlargement of the thyroid gland can usually be detected and in the primary variety eye signs are usually present When a case defies certain clinical diagnosis a radio active iodine uptake test is necessary to decide between the two conditions

Another patient, although he may do his best to conceal it by harping on some purely physical and often trivial symptom, is clearly in a state of agitation and/or depression Both may be

due to something which has happened recently in his life, although he may not be prepared to disclose it to the doctor at once But depression, particularly depression alone, may be endogenous, i e from within and inexplicable In the latter case it is always a serious condition on account of the risk of suicide Hence the importance of recognizing depression, and agitation due to it, which the patient often tries to hide and often succeeds in hiding successfully Talking to him however reveals that the working of his mind is retarded He cannot look ahead, think or take decisions His ration of hope has departed and he is passing through a dark tunnel of despair Further, physical function such as appetite and defaecation is often seriously upset Sleep, too, is often characteristically disturbed, the patient waking in the early morning knowing that he has no hope of any sleep again

A patient in a state of depression is often not prepared to talk at first He wants to cover it up If he talks he is afraid of breaking down Nevertheless, with a little tact the truth is soon out, often with a sudden emotional reaction Sometimes, however, a patient continues to refuse to talk and all his answers to questions are monosyllabic and entirely unemotional Not a vestige of expression crosses his face and it proves quite impossible to get him to show any interest in anything or express any feeling in respect of friends, relatives or ordinary human affairs Clearly he is completely withdrawn into himself and before long some strange utterance or expression may reveal that he is living, not in the real world in which ordinary people live, but in an unreal world born of his own imaginative creation Such is the clinical picture, so important but sometimes so difficult to recognize, of the schizophrenic state

Mania, excitement unjustified by circumstances, on the other hand, is hardly likely to be missed The patient sees no reason to cover that up He feels fine Let the world know it! Confusion is also seldom difficult to recognize The patient does not know the time of day not even whether it is day or night, the day or the week or the month of the year He does not know where he is or what he ought to be doing and fails to recognize his relatives and friends He has forgotten his age He does not even know his name or parentage In short for the time being he has completely lost touch with his past and with his own identity

In a state of confusion a man is quite incapable of sustained thought But sometimes intellectual defect may be present in some more subtle form It may gradually become clear from talking to a patient that he is beginning to lose his memory and that his mind cannot work as fast as it clearly should Answers to simple questions come out slowly He keeps making mistakes He cannot add up figures and memory for recent events is obviously impaired So he sits all day without thinking not because he is depressed and his mental processes retarded or because he is withdrawn into an unreal world like a schizo phrenic, but because his capacity to think is declining In other words he is suffering from dementia

Pain

Pain has some physical cause in most cases, although sensi tivity to it varies much in different people, for example, a woman may have her first baby almost without it, all a person s teeth decay with scarcely any Nevertheless it is always psychological in the sense that it is an event in consciousness Indeed, pain demands consciousness Whence it follows that the amount of pain which a person suffers as the result of some physical stimulus is likely to be affected by his emotional reactions On the one hand fear as to its possible cause and lack of self control are liable to fan its flames On the other as the stage of consciousness can only be occupied by one thing at a time, if the mind is sufficiently distracted and the stimulus not too strong, pain of physical origin can almost completely disappear For example if something sufficiently arresting happens an aching tooth may be forgotten for the time being and the saints and martyrs in their spiritual exaltation must have succeeded in suppressing pain at the psychological level to a degree far beyond the capacity of the ordinary man So unless and until its physical cause is known the extent to which a patient is really suffering may be difficult to assess

The next question to be decided is the particular part or organ of the body from which the pain is most likely to be com ing That one must always be answered before the pathological process responsible for it can be guessed with any degree of certainty and if any physical signs have been found, it is seldom difficult For example when a joint is swollen, the origin of

the pain in that limb leaves little room for doubt But so often there are no physical signs and then, 'back to the patient's symptoms,' it may be difficult to decide where his pain starts, particularly as where it is felt may be misleading on account of the phenomenon of referred pain Pain felt in the shoulder, for example, may originate in the diaphragm, in the neck or arm, in the heart, down the leg, in the spinal canal In the head it may prove to originate in an eye in which the tension has started to rise (glaucoma), in a tooth which has begun to decay exposing a nerve (caries), or in a sinus of the nose which has become infected (sinusitis) Nor is the character of pain, with the exception of colic due to spasm of plain muscle, of any great value in deciding where it really starts although the *combination* of its character, site and radiation sometimes yields the clue as to whence it really comes

Nevertheless, the most important criterion in trying to decide whence pain comes is not where it is felt, which is often misleading, nor what it is like, which is often difficult for the patient to describe, but the particular function of the body to which it is related Pain on breathing, for example, must originate in the pleura, intercostal muscles or ribs, in the chest on exertion, in the heart, in the legs on walking, in the tibial muscles, on performing a certain movement, in the ligaments or joints involved in it Similarly pain on swallowing is almost bound to come from the oesophagus, after eating from the stomach or duodenum, in relation to bowel action from the colon, and on or after micturition from the bladder, prostate or urethra Continuous pain unrelated to any particular demand on function, if of organic origin, must be due to an active pathological process in an organ on which no sudden functional calls of a mechanical kind are made Persistent pain in the upper abdomen, for example, may be due to disease of the liver, pancreas or peritoneum, and in the spine or limbs to a pathological process affecting bone but leaving joints and muscles untouched

Pain may also be due to primary functional disorders however, and the differential diagnosis, and it is a terribly important diagnosis, between psychogenic and organic pain turns on three points, the relationship of it to demand on physical function, the characteristics of it, and the patient s personality

Organic pain, as has been seen already, usually bears a

definite relationship to demand on function Psychogenic pain, on the other hand, runs parallel not with physical function, but with the patient s emotional life, and to the outsider therefore appears to have no fixed habits There seems no rhyme or reason" about it In the nervous person it comes on when he gets scared, and therefore very frequently when he has nothing to do at the end of the day for example sitting in the train going home after work or watching a dull programme on TV in the evening On the other hand the patient with the hysterical diathesis turns it on whenever he wants it to evade some obligation or to get his own way at home, and always to impress the doctor So hysterical pain tends to be always there, as opposed to organic pain which tends to supervene only with demand on function

Organic pain has certain definite characteristics by virtue of which it rings true It is of the kind which conforms to what we know of *physiological function and anatomical structure* It comes at the right times is felt in the right place, and radiates in the right direction Psychogenic pain on the other hand produced by suggestion or being the patient s own idea of what a pain should be seldom rings true There is something phoney about his description of it Sometimes indeed, it is quite fantastic spreading in a way that the structure of the nervous system could not possibly permit Further his emotional reactions are usually obviously at fault The anxiety neurotic is usually scared his whole sympathetic nervous system in obvious over action Hysterical pain on the other hand being exactly what the patient wants to serve his immediate purpose, is usually affording him boundless satisfaction He may protest that it keeps him awake all night but he shows no signs of physical fatigue whatever

Lastly in the differential diagnosis between organic and psychogenic pain particularly between organic and hysterical pain a study of the patient s personality may be very important indeed The anxiety neurotic is so made that he is liable to pick up every idea of disease and to get aches and pains and various functional disorders born of fear and mental unrest in consequence The hysterical diathesis is more difficult to spot and hysteria should always be considered as a possible explanation of pain difficult to explain on an organic basis in a

self centred person, particularly if there is an obvious advantage in having it and particularly if he has been known to 'escape' hysterically before On the other hand, a psychoneurotic person and one of hysterical personality can both develop organic disease and in them the characteristic clinical picture of it is often obscured by their emotional reactions to their symptoms So every patient must be given the benefit of any doubt and investigations set in train to exclude organic disease as a cause of pain if there seems any chance of it whatever

Vomiting

A patient who says that he keeps being 'sick' has not necessarily been retching or vomiting Acid fluid from his stomach may have merely been regurgitating into his mouth and he has kept spitting it out Or he has been feeling 'sick" and spitting out saliva Careful history taking will, however, usually decide whether a patient has been retching For in it the diaphragm descends and the abdominal wall is drawn in, the patient being conscious of the latter If that happens, then there is usually no doubt that the patient has been vomiting

Anybody can attempt to vomit (retch) but the normal person can only actually do so, i e expel the contents of his stomach, when it is out of sorts and one of the reflexes known to activate vomiting is in operation Nevertheless, true vomiting can be hysterical A person with that diathesis of mind can, it appears, turn it on to suit his convenience, just as he can turn on loss of voice or "throw a fit, which the ordinary person is quite incapable of doing Apart from this, true vomiting, as defined above, must be either central (cerebral) or peripheral

A cerebral cause (which it is always most important not to miss) should be suspected when vomiting is associated with headache Nevertheless, cerebral vomiting is not always associated with it and should be suspected whenever vomiting in an emotionally stable person is unaccompanied by giddiness or abdominal pain 'Inexplicable vomiting may be the first and sole sign and symptom of a cerebral tumour

Peripheral vomiting is suspected if there is evidence of a disease process in any part of the body where stimulation is known to be capable of causing reflex vomiting Thus it may be due to disease of the eye, as in some cases of glaucoma to

disease of the ear, as in Meniere s syndrome to biliary or renal colic, to irritation of the peritoneum or as in most cases, to reflex stimulation from the gastro intestinal tract

In gastro intestinal vomiting, probably the commonest cause of reflex vomiting, the peripheral stimulus may be of one of two kinds, irritative or obstructive The former is due to interaction between the nature of the gastro intestinal contents and the degree of sensitivity of the gastro intestinal mucous membrane, the latter due to mechanical obstruction on account of muscular spasm oedema or fibrosis, sometimes at the cardia, usually at the pylorus and occasionally lower down Irritation should be suspected if the patient keeps vomiting small quantities consisting mainly of gastric juice with just a little food obstruction, if he vomits food in large quantities at a time Vomiting large quantities at very infrequent intervals e g of several days, always suggests pyloric obstruction sufficiently gradual in onset to have allowed enough time for gross dilatation and hypertrophy of the stomach

Vomiting may also be due to a sudden increase in the volume of the gastro intestinal contents from within due to gastric or duodenal bleeding Bright red blood suggests a sudden haemorrhage into the duodenum precipitating the vomiting reflex immediately, partially digested blood, looking like coffee grounds haemorrhage into the stomach allowing time for gastric digestion before the vomiting reflex came into operation

Constipation

Constipation dating from birth must be due to an imperforate anus and observed to start in infancy may be due to Hirschsprung s disease but when a patient comes *complaining* that his bowels won t work he is invariably suffering from a functional disorder His colon is exercising excessive delaying action on the passage of its contents very often, as already explained (page 24), actively resisting chemical aperients and pain under these circumstances is due to colon spasm or, to be more exact lengths of it in which haustration is failing to give way in the face of normal peristaltic rushes The abdomen is never distended although hard masses due to impacted faeces are sometimes felt particularly in children and old people Nor

is peristalsis visible except when the abdominal wall is very thin The rectum is full of hard faeces

Acute constipation, i e sudden cessation of bowel action, may be due to, indeed usually is due to, sudden functional disturbance of the colon as above described Under these circumstances the same diagnostic criteria hold But it can be due to mechanical obstruction which, although it usually starts slowly and is associated with spurious diarrhoea, may lead suddenly to cessation of bowel action The rectum is now found empty, or anyhow does not fill again after an enema Further, the abdomen does become distended and peristalsis is soon visible, while colicky pain increases and on auscultation the whole abdomen is full of sounds Sudden cessation of bowel action after an abdominal operation, and occasionally in acute infections, is likely to be due to paralytic ileus The physical signs are identical with those of mechanical obstruction with two important exceptions No peristalsis is visible and on auscultation the abdomen is silent

Diarrhoea

Diarrhoea may be due either to a rectal discharge (spurious diarrhoea) or to the frequent passage of faecal matter, i e food derived intestinal contents in loose form (true diarrhoea) The distinction between them can only be made by inspection of the patient's stools A rectal discharge, which may consist of pus mucus or blood, or some mixture of them, can only come from the colon, usually comes from its lower part and is a common feature of chronic organic obstruction of it Hence the apparent alternating constipation and diarrhoea, the former being due to the obstruction and the latter to the intermittent passage of the discharge that accumulates above it In the absence of constipation a rectal discharge always points to some pathological process affecting the lower colon

True diarrhoea is far more common If the patient's stools are loose and yellow, like pea soup (due to unchanged bilirubin) it must originate in his small intestine and is due to small intestinal hurry without adequate increased colonic delaying action to compensate for it If they are bulky and greasy, it must be due to failure to split or absorb fat in his small gut Then he seldom complains of much pain Diarrhoea accompanied by

pain particularly pain related to defaecation, is usually colonic in origin and with absolute certainty colonic if the stools contain blood and mucus Diarrhoea originates in the colon in most cases

Frequency of Micturition

This is first noticed at night, the patient being repeatedly compelled to get out of bed to pass his urine By day it often passes unnoticed Usually he passes only a small quantity each time When he passes quite a lot his total excretion must be increased, and under these circumstances he is likely to complain of thirst, and may go to bed with a jug of water beside him These two types of frequency, that with the passage of small and that with the passage of normal or large quantities at each act of micturition depend on two very different disturbances of function The former can be produced in many ways The latter is the inevitable result of the total excretion of urine being increased

Frequency of micturition of the small quantity kind, associated with actual pain or a burning sensation in the perineum during and after each act, must be due to a hypersensitive state of the prostatic urethra or the trigone of the bladder such as may be caused by congestion or inflammation, and is sometimes associated with priapism As the bladder fills the reflex through the spinal cord on which micturition depends is operated prematurely In an ageing man frequency of this kind without pain or discomfort, may be merely due to a decline in the efficiency of his bladder as a reservoir but associated with delay in starting the flow and a thin stream must mean mechanical obstruction This may be in either his prostatic or penile urethra His bladder never empties completely some residual urine always being left behind and he must micturate more often in order to eliminate a normal quantity Indeed if obstruction develops sufficiently slowly his bladder becomes dilated (to accommodate the residual urine) and hypertrophied (to overcome the obstruction) with the result that its fundus may be felt above his symphysis pubis after he thinks he has emptied his bladder completely It may even be felt reaching almost to the ensiform cartilage in a patient who has never complained of urinary symptoms

If signs of organic disease are found in the nervous system

painless frequency is likely to be due, not to anything wrong with the urinary tract, but to interference with the reflex paths through the cord on which micturition depends or with the pyramidal control of the reflex act If the patient's bladder is palpable, he is suffering from retention and overflow, as in mechanical obstruction of the urethra, although for an entirely different reason If it is not palpable, the defect is probably on the sensory side as, for example, in tabes dorsalis The vesical sphincter is relaxed and his urine dribbling incontinently away

Painless frequency associated with the passage of a normal or abnormally large amount of urine at each act must mean that its total excretion is increased This may be due merely to excessive ingestion of fluid Far more often it proves to be 'organic If the patient has a good appetite, but is losing weight, sugar will almost certainly be found in his urine He is suffering from diabetes mellitus, the demand for the excretion of sugar creating the necessity to pass more urine and drink more water Occasionally frequency of this kind proves to be due to renal failure For in advanced chronic kidney disease failure of the tubules to reabsorb water may outweigh failure of glomerular filtration with the result that the total volume of urine passed is actually increased The differential diagnosis between these two conditions is however easy In diabetes the specific gravity of the urine is high due to the sugar which it *must* contain, in chronic renal failure low on account of the absence of urea which it *should* contain Further, in the latter condition it contains albumin and the blood pressure is usually raised

Very occasionally the patient's urine is of low specific gravity and contains no albumin Further, it is clear from his history that the thirst of which he complains is secondary to increased secretion of it Under these circumstances his polyuria and frequency are due, not to the demand for the excretion of sugar as in diabetes mellitus, but to failure of the posterior lobe of his pituitary to secrete the anti diuretic factor He is suffering from diabetes insipidus

Loss of Weight

Rapid loss of weight must be due to loss of body water, and this is the likely explanation of it in a patient who has been

vomiting for some time, sweating profusely, passing large quantities of urine or suffering from chronic diarrhoea Gradual loss of weight is more likely to be due to loss of body substance, and this may be caused by many different disorders of function

If the patient has lost his appetite, started to diet himself for some supposed disease is living alone and not bothering about eating or existing under poor conditions loss of weight is always likely to be due to deficient food intake in relation to exposure to cold and work done An infant losing or failing to gain weight may not be getting enough milk from its mother s breasts or from its bottles In the latter case the history will usually settle the point In the former test feeds may be necessary Or, it may be some intestinal worm is competing with the patient for his food and in countries where parasitic infestation of the gut is common this possibility must always be borne in mind

A patient who is passing large pale greasy, frequent stools must be suffering from failure to absorb his food Occasionally this is due to failure of pancreatic digestion of protein and fat more often to failure of the small gut to absorb normally digested fat as in congenital steatorrhoea and tropical sprue Anaemia, pellagra like symptoms and decalcification of the bones would confirm this diagnosis Failure of absorption is however an uncommon cause of loss of weight It should not be diagnosed too readily

A patient who complains of loss of weight in spite of a good appetite is likely to be suffering from diabetes mellitus and to complain of thirst and frequency of micturition of the painless large quantity variety, his loss of weight being partly due to loss of body substance and partly due to loss of body water But sometimes a diabetic loses weight without any of the other three cardinal symptoms of this disease Hence the particular importance of testing the urine in every case of progressive loss of weight

Another common cause of loss of weight is the extravagant use of food normally digested and fully absorbed that is to say a high metabolic rate Feeling hot or cold out of relation to the weather, shivering sweating at night, general malaise and vague aches and pains, always suggest low grade fever as the most likely explanation of it Rise of metabolic rate, and therefore

loss of weight, may also be due to thyrotoxicosis The diagnosis is obvious in most cases but an adenoma may be too small to be felt and in *secondary thyrotoxicosis eye signs are absent* Over secretion of thyroxine should always be suspected as a cause of loss of weight when diabetes has been excluded and investigation fails to reveal any evidence of fever to account for it

Malignant disease causes loss of weight when it leads to loss of appetite, vomiting or inability to swallow, or to infection and fever as in so many cases of carcinoma of the lung But some times it seems to lead to loss of weight in a way which cannot be explained On the other hand, in an ageing man or woman loss of weight should not be attributed to malignant disease too readily Many people, as they get older, particularly men (women often tend to put on weight), start to lose it for a while in anticipation, at least so it seems, of settling down at some new and permanent weight level

Shivering and Sweating

Patients do not necessarily use the right words to describe their symptoms One may say that he shivers, when he really trembles, and another that he trembles, when he really shivers, shivering being fibrillary muscular contraction producing heat, *trembling rapid, intermittent action of whole muscles* on account of nervous stimulation serving no functional purpose So, when a patient complains of repeated attacks of shivering or trembling it may be difficult to decide on the history alone whether his attacks are emotional in origin or due to sudden bursts of fever, that is to say, of the nature of rigors If, however, he is seen in an attack physical examination and the clinical thermometer will settle the diagnosis immediately

In an emotional attack he is obviously trembling rather than shivering His pulse is raised and his skin clammy with sweat, but never hot, and, on being taken, his temperature is found to be normal In a rigor his pulse rate is raised and his skin *is burning* hot at first, in spite of which he feels cold, often shivering (heat production in his muscles) and huddling under his bed clothes The thermometer reveals that his temperature is rising rapidly Loss of heat by sweating has suddenly been turned off and heat production by shivering suddenly turned on He now feels cold

because he takes himself and his feelings as his system of reference, the atmosphere round him now being *relatively* much colder than it was before Then heat production is suddenly called off by stopping shivering and heat loss suddenly turned on by starting sweating with the result that his temperature falls fast Now he complains of how hot he feels and throws off his bed clothes, although to the hand his skin feels cold The patient shivers in fact not because he is cold, but to make himself hot, and sweats, not because he is hot but to make himself cold by increasing evaporation from the surface of his body

Rigors teach a lesson Feeling cold out of proportion to the temperature of the day points to a rising temperature, feeling hot and sweating to a falling one So when a patient complains of having been feeling hot or cold, or alternately first one and then the other out of relation to the temperature of his environment he has probably been suffering from a raised temperature for some time a diagnosis often confirmed by a history of headache, lassitude anorexia and pain in the limbs And it is a most important diagnosis low grade fever not only being a common cause of just not feeling well but so often the outward visible sign of an inward pathological process, usually infection sometimes hypersensitivity not infrequently new growth and occasionally intravascular thrombosis Further it is not only important to suspect fever from a patient s symptoms but often also possible to gauge how long he has had it It may even be possible to guess the form it has been taking In one case he has obviously been febrile continuously for days or even weeks in another his temperature has probably been rising at night and falling every morning in a third his fever has been of the remitting and relapsing type

Giddiness

When a patient comes complaining of attacks of giddiness the first thing to find out is exactly what he means If, as so often he feels as if he was turning round swaying about or moving up and down or while he remains stationary his surroundings seem to be moving round him, he probably suffers from repeated abnormal stimulation of his labyrynth or of his vestibular nerve or its central connexions in his brain If he says that everything

suddenly starts to revolve round him (vertically or horizontally) so that, unless he catches hold of something, he falls (and some times vomits violently), this diagnosis is certain He is suffering from true vertigo Further, as most cases of this kind are due to pathological stimulation of the internal ear, a history of tinnitus and increasing deafness may clinch the diagnosis of the vestibular origin of his attacks The difficulty is that giddiness may also be due to anaemia of the connexions of the vestibular nerve in the brain with the result that cerebral anaemia may also lead to vertigo Anaemia of the brain, however, usually leads to feeling faint rather than to feeling giddy But an elderly person often feels giddy as well as faint, when he suddenly stands up, and anyone after rising from a prolonged stooping position, particularly on a hot day, for example after hunting for a book "off the bottom shelf," may feel giddy due to delay in his circulatory readjustments Vertigo and cerebral anaemia are *difficult to disentangle*

Faintness, Loss of Consciousness and Fits

Feeling faint is a common symptom A patient may come complaining of repeated attacks of just feeling faint and being compelled to lie down or of feeling faint, sweating, blacking out, i e losing his sight and then actually losing consciousness He may have just fainted for the very first time Or he may say that he keeps losing consciousness completely without any previous warning Attacks of this kind are often difficult to interpret and without the evidence of an eye witness, that is to say, on the patient's own account of them alone, it may prove almost impossible There are three possible causes of them, cerebral anaemia, hypoglycaemia and epilepsy In general, loss of consciousness preceded by feeling faint and palpitation is *usually due to cerebral anaemia* *Preceded by much sweating* it is possibly due to hypoglycaemia but patients who faint on account of cerebral anaemia, particularly when this is due to emotional causes, also sweat Abrupt loss of consciousness without faintness, sweating or palpitation, even if not preceded by any sensory aura, is almost certainly epileptic

In an elderly man fainting is always likely to have been due to local cerebral anaemia caused by spasm of an atheromatous cerebral artery and this diagnosis is certain when the attack is

followed by aphasia or monoplegia so transient that no structural damage can have been done as in thrombosis and haemorrhage Fainting attacks in the elderly are, however, difficult to diagnose exactly and it is sometimes impossible to distinguish between attacks of this kind and attacks of aural vertigo

In a young person fainting is usually due to sudden fall of blood pressure brought about by some primary functional disorder and the attack which results from it correspondingly unimportant, the patient quickly recovering when he lies flat, and often if he just sits down and puts his head between his knees Further, the mechanism of the pathogenesis of the attack is often obvious from the circumstances under which it occurred For example, fainting on parade on a hot day is almost bound to be due to failure of venous return from the lower part of the body to the right heart as the result of a combination of peripheral vaso dilatation and muscular inaction fainting in a paroxysm of coughing (in a child with whooping cough or an adult with bronchitis and emphysema) due to failure of return of the arterial blood from the lungs to the left heart on account of rise of intrapleural pressure Fainting attacks due to fall of systemic pressure also tend to occur when anyone is sickening for some acute infection on account of failure of his vaso motor centre to maintain vaso constriction, and also in a nervous person at the sight of blood or during a minor operation on account of emotional inhibition of it The pulse usually quickens and in an emotional attack the patient may complain of palpitation as well as feeling faint If his pulse slows, he is in a true vaso vagal attack and the fall of blood pressure responsible for his transient cerebral anaemia due not only to peripheral vaso dilatation but also to fall in cardiac output

When a patient faints and does not recover consciousness and colour quickly as soon as he lies flat internal haemorrhage is the most likely cause of his fall of blood pressure and should always be suspected if he gives a history of epigastric pain in relation to meals, suggesting a peptic ulcer or one suggesting some other cause of internal bleeding Vomiting blood confirms the diagnosis of gastro intestinal bleeding immediately and a melaena stool may confirm it later

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cyanosis of his face, frothing at his mouth and convulsive movements of his limbs From the patient s story alone, however, diagnosis may be difficult Indeed, it is often impossible to find out whether he actually loses consciousness in his attacks An electro encephalogram may settle the diagnosis but in the absence of evidence from other people it may be impossible to decide with certainty at first between epileptic fits and ' fits ' of hysterical nature

Cough

Cough is a protective reflex and except for the repeated nervous cough (a form of habit spasm seldom difficult to recognize), is invariably due to pathological stimulation of some part of the respiratory tract After an abrupt inspiration, forcible expiration starts with the vocal cords adducted, raising the pressure in the lungs Then the cords are suddenly abducted and air shoots out explosively Hence the noise of the cough and the sudden expectoration of any mucus which has been accumulating at the back of the throat in the trachea or even in the larger bronchi

If the patient is suffering from disease of his pleura or is having his chest tapped, cough (in the latter case often as the pleural surfaces previously separated by fluid start to come together) is likely to be pleural in origin Cough of this kind serves no useful purpose and is an unfortunate by product (in pleural pain it may be exceedingly distressing) of the basic protective reflex mechanisms with which the body is endowed

The majority of coughs are due to stimuli arising in the pharynx, trachea or bronchi and may be productive or unproductive of sputum A harsh and dry one often means a hypersensitive state of the back of the pharynx or trachea leading to a tickle in the throat Most coughs are probably of this kind, the smoker s cough for example (which must not be diagnosed too readily) and that of influenza A dry cough can, however, originate much lower down the respiratory tract but on the cough alone it is usually impossible to say exactly whence it comes If it sounds moist sputum is not far away in the sense that such a cough is likely to become productive soon, and a very moist one is sometimes only unproductive because the patient is too weak or ill to develop the necessary

Fall of blood pressure leading to feeling faint at any age may also be due to sudden failure of cardiac output This is always due to some organic cause Consciousness of over rapid and forcible action of the heart preceding it suggests some variety of paroxysmal tachycardia Seldom, however, is it possible to distinguish with any degree of certainty (from the patient's account alone) between nervous fainting, due to fall of blood pressure with secondary tachycardia, and fainting or feeling faint due to primary tachycardia leading to diminished cardiac output and secondary fall of blood pressure He must be seen in an attack and an electrocardiogram obtained if possible A very slow pulse or intermittent dropped beats in an elderly man suggests recurrent heart block A history of epileptiform convulsions the onset of which may be extraordinarily abrupt, goes far to confirm this diagnosis An electrocardiogram settles it immediately

When there is no obvious primary functional cause for a patient s fainting attacks, examination of his heart reveals no abnormality and there is no evidence of internal bleeding, the possibility of recurrent hypoglycaemia rather than recurrent cerebral anaemia must always be considered The symptoms of these two conditions can be almost identical although sweating is more marked in hypoglycaemia which is the most probable explanation of fainting attacks in a diabetic under insulin assessment, recovering from an acute infection (and now requiring less insulin), indeed in any diabetic, and also a likely explanation of feeling faint after meals in a patient who has recently had a partial or complete gastrectomy It is a possible explanation of feeling faint, although rarely of loss of consciousness, in a person who has undertaken a long period of strenuous muscular exertion without food Very occasionally an adenoma of the islet tissue of his pancreas is over producing insulin but only repeated blood sugar estimations will confirm this diagnosis

When a patient comes complaining of repeated attacks of loss of consciousness without any warning of faintness, palpitation or sweating he is likely to be suffering from epilepsy This diagnosis will be confirmed if the attacks are preceded by a sensory aura of any kind, if he gives a history of ever having bitten his tongue or hurt himself, and if a witness of one of his attacks has observed

Cyanosis

When a patient looks blue either the percentage oxygen saturation of his arterial blood is below seventy five per cent or the proportion of venous to arterial blood in and colouring his skin is increased The former is known as central and the latter as peripheral cyanosis

If his mucous membranes are blue notably those of his lips tongue and mouth and his venous pressure as judged from looking at the veins in his neck, is not increased, his cynosis must be central (The only condition for which this might be mis taken is methaemoglobinaemia following the administration of sulphonamide drugs) If the patient is a child some of his venous blood is probably by passing his lungs He has a patent auricular or ventricular septum *and* pulmonary stenosis the latter reversing the normal direction of the shunt An elderly patient with a paroxysmal cough is likely to be suffering from emphysema, the internal surface area of his lungs being so reduced that his venous blood is not being oxygenated suffici ently Central cyanosis due to this cause is however, likely to coexist with some peripheral cyanosis due to congestive failure on account of the difficulty his right heart is having in getting his venous blood through his lungs In a patient who is obviously suffering from acute broncho pneumonic infection central cyanosis must be due to large areas of his lungs being out of respiratory action (on account of obstruction of the bronchioles), the blood still circulating through them but to no useful respiratory purpose In a patient with chronic lung disease central cyanosis may also be due to fibrosis of lung substance

If his face *and* extremities are blue rather than his mucous membranes his cyanosis must be of the peripheral type If the veins in his neck are congested, but there is no corresponding congestion in his legs the former must be obstructed (Other signs of mediastinal obstruction are likely to be present) If his *general* systemic venous pressure is raised (a much more common condition), as evidenced by raised pressure in the veins of his neck *and* other signs of congestive heart failure, peripheral cyanosis must be due to failure of cardiac output damming back the blood in his venous system

If his extremities are blue rather than his face, and the

intrapulmonary pressure to cough his sputum up This kind of cough is failing to effect the purpose for which the reflex was intended

Sputum may consist of pure mucus, clear and jelly like, of blood, bright red or dark, of pus, yellow or green according to the organisms producing it, and in acute oedema of the lungs of thin pink fluid More often it consists of some mixture of two or more of these ingredients and the commonest is muco pus, i e mucus rendered opaque by being mixed with a certain amount of pus Usually the patient coughs up about an equal amount throughout the day When he coughs up a large quantity at one go, often first thing in the morning, particularly if he leans out of bed with his head down, secretion must have been accumulating in cavities in one or both his lungs during the night Yet neither sputum nor blood coughed up necessarily comes from the lungs If he gives a history of symptoms suggestive of chronic nasal catarrh or sinusitis, or of repeated nose bleeding, pus or blood from his naso pharynx may have tracked down the back of his throat to be coughed up later

Certain coughs are diagnostic of or at least suggest disturbance of function of a certain kind The nervous cough has already been mentioned In pertussis a succession of short, quick, expiratory efforts with the vocal cords adducted leads to rise of intrapleural pressure and obstructs the return of venous blood to the heart with the result that the child goes blue in the face, and may have a syncopal attack, until the spasm of the vocal cords relaxes and air rushes into the lungs leading to the characteristic whoop In an adult a dry paroxysmal cough with cyanosis and sometimes syncopal attacks but without the final whoop, is likely to be due to *emphysema* A brassy element added to a cough of this type suggests bronchial obstruction and if stridor is audible, i e if the patient cannot inspire silently, his respiratory tract must be obstructed at a high level i e at or above the bifurcation of the trachea This diagnosis is confirmed if he is clearly experiencing inspiratory difficulty as opposed to the much more common expiratory difficulty of asthma and emphysema A silent ineffectual cough can only mean paralysis of the vocal cords

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systemic venous pressure is not raised, cyanosis is more likely to be due to local causes Congested veins in one arm or leg suggest local venous obstruction and when this is of both legs it may be due to obstruction on both sides or to obstruction of the inferior vena cava Cyanosis can also be due to varicose veins, a certain proportion of the blood circulating round the leg instead of returning to the heart When, on the other hand, peripheral cyanosis is most marked in the hands, it is more likely to be due to capillary dilatation allowing over much time for oxygen to be taken out of it (hence the blue colour) and over much time for loss of heat (hence their coldness) This is a more or less permanent condition, although always most marked in cold weather, and often associated with getting chilblains in the winter Cyanosis of the hands, and sometimes feet, which comes on in attacks is likely to be due to Raynaud's phenomenon, i e to spasm of the digital arteries, as the result of exposure to cold The patient s hands go dead white and then turn blue as venous blood runs back into the capillaries to be still further deprived of the oxygen which it contains This diagnosis of the cause of blue hands is certain when the arterial circulation is suddenly restored and they turn red, throb and tingle

Signs in the Lungs

When a patient complains of shortness of breath on exertion there is never any doubt as to what he means Everyone is familiar with it For, when any man runs, he is pulled up sooner or later by an unpleasant feeling associated with increasing difficulty in getting his breath Further, however much 'guts' he may possess, he is compelled to stop before he has strained his heart on account of the fact that the maximum ventilation of which his lungs are capable, and the maximum amount of carbon dioxide and oxygen which his blood can carry, fail to keep the internal environment of his body constant *before* his heart has been taxed to full capacity But in disease one member of this trinity may fail before the other, leading to premature shortness of breath on attempted effort and before long to structural change The diagnosis of the functional disturbance responsible for shortness of breath now depends mainly on the findings on physical examination

If the zero position of the patient s chest is shifted in the

inspiratory direction, his respiratory excursion small, his cardiac and hepatic dullness reduced and his breath sounds difficult to hear, his shortness of breath is likely to be due to emphysema If, on the other hand expiration is laboured, and on auscultation the expiratory phase of breathing is prolonged, his bronchi must be in a state of congestion and muscular spasm, i e he is in a chronic asthmatic state Moist sounds* mean inflammatory exudate in his bronchi, rhonchi (continuous sounds) in his large coarse crepitations (discontinuous sounds) in his smaller ones This partially blocks them and renders it still more difficult for him to get air in and out of his lungs And so often these three factors emphysema broncho spasm and bronchitis conspire to render a patient short of breath Nevertheless it is usually possible on clinical examination of his chest not only to state categorically that his heart is sound and his shortness of breath pulmonary but to assess approximately the relative part being played by these three factors in its pathogenesis

If the base of one lung is dull on percussion, there can be no air in it It must be consolidated by acute or chronic inflammation, infiltrated with new growth or collapsed on account of obstruction of its bronchus Or there must be an effusion *of fluid into that pleural cavity which has allowed the lung to* relax All these three conditions reduce vital capacity and are possible causes of shortness of breath To which is it likely to be due in the individual case? The answer to that question (pending an X ray of the chest) turns on the other physical signs with which the dullness is associated If the heart is not displaced (as judged from the position of the apex beat) and the vocal fremitus is increased and particularly if tubular as opposed to normal vesicular breathing is heard over it (i e the sounds produced by the passage of air backwards and *forwards through the smaller tubes are being conducted to the*

* The nomenclature of moist sounds is unfortunately confused Laennec, who first described them introduced the word *rale* maintaining that *all* these *sounds were of a rattling kind But that is not so and to avoid* the use of a word associated with the death rattle the word rhonchus the Greek for rattling was introduced (quite illogically) to describe the continuous sounds produced by narrowing of or by plugs of mucus in the larger tubes and the word crep tation to describe the discontinuous sounds produced by air bubbling through fluid in the smaller ones These latter are still called *rales* by some clinicians In the opinion of the authors with all due deference to Laennec the word *rale* is best not used better to talk about rhonchi low and h gh pitched and about crep tations coarse medium and fine

ear), then the lung must be consolidated by extravasation of inflammatory exudate into its alveoli (These are the classical signs of acute pneumonia of lobar distribution, an upper lobe being sometimes affected) If, however, the breath sounds are absent, or normal but diminished, the lower lobe on that side has either collapsed on account of bronchial obstruction or relaxed on account of fluid collecting in the pleural cavity * Again, the differential diagnosis between these two possibilities turns on the position of the mediastinum If the apex beat is displaced to the opposite side, it is fluid , if to the same side, collapse ' But diagnosis on physical signs demands a *sufficient* degree of collapse and a *sufficiently* large collection of fluid to produce them In lesser cases of either condition an X ray of the chest is necessary

When the breath sounds are reduced or absent, but percussion still yields a resonant note, there is only one possible explanation of what has happened Air must have got into the pleural cavity on that side allowing the lung to relax and, when a sufficient quantity has got in the mediastinum will be found shifted to the opposite side But again the lesser degrees of pneumothorax can only be suspected from the patient s history and his physical signs An X ray of his chest is often necessary to confirm or rule out this diagnosis

Shortness of breath can also be due to chronic disease of the lungs Thus fine crepitations at both bases with some impairment of percussion note on both sides suggests oedema due to left heart failure for which, if that is their explanation, some cause will usually be found Medium crepitations at one or both bases, or anywhere in the lung, suggest inflammation of the bronchioles, and coarse crepitations inflammatory fluid in a cavity which may be either bronchiectatic or tuberculous, due to an abscess or due to the breakdown of a primary or secondary new growth Impairment of percussion note with moist sounds and some displacement of the mediastinum to the same side *suggests chronic inflammation with some fibrosis, and physical* signs of this kind over an upper lobe or middle zone are almost certain to be due to fibrosis rather than to fluid in the pleural cavity It is impossible, however, to review *all* the combinations of physical signs that may be due to the many acute and

* See footnote on page 73

chronic pathological processes which can affect different parts of one or both lungs Sufficient has been said to indicate how in conjunction with the patient s history some idea can usually be gained of what is happening or has happened in his chest pending an X ray of it on which accurate diagnosis always depends

Signs in the Heart

When a patient complains of undue shortness of breath on exertion and no signs can be found in his lungs to account for it the question arises at once as to whether it is cardiac in origin or merely due to nervousness or general physical unfitness

If he is obviously anaemic or thyrotoxic, he is probably suffering from high output failure In the former condition the circulation rate must at least be maintained to compensate for the poor quality of his blood and in the latter to provide the oxygen to the tissues to meet the high metabolic rate of that disease Further in both these conditions the myocardium is handicapped at a time when more work is expected of it in the former by the poor quality of the blood supplying it, in the latter by the increased secretion of thyroxine which is well known to affect it adversely

If the apex beat is forcible and displaced downwards and to the left and this displacement cannot be explained in terms of pulmonary fibrosis, collapse or relaxation, the patient s left ventricle must be hypertrophied It is struggling with some handicap to the performance of its function of getting the blood through the arteries into the capillary bed If his blood pressure is found raised he is suffering from peripheral vaso constriction, increasing dyspnoea now pointing to failing blood supply to the myocardium rendering the maintenance of sufficient hyper tension difficult He is short of breath not because his blood pressure is high but because his left ventricle cannot keep it high enough

If a murmur is heard on auscultation the patient may be suffering from valvular disease But this does not by any means *necessarily follow even if he is short of breath All murmurs* do not mean organic disease and some are of no pathological significance

A rough systolic murmur over the aortic area conducted up

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incompetence, it obstructs the flow of blood from the lungs into it and predisposes to venous congestion and oedema of them reducing their vital capacity Under these circumstances the right ventricle hypertrophies (as evidenced in some cases by displacement of the apex beat to the left and marked right ventricular pulsation in the epigastrium and behind the lower end of the sternum) to maintain the pulmonary circulation as in emphysema (cor pulmonale) A systolic murmur over the tricuspid area points to functional tricuspid incompetence Very occasionally this is organic in origin

A systolic murmur over the centre of the heart suggests a patent interventricular or interatrial septal defect a murmur running continuously through systole and diastole a patent *ductus arteriosus A loud murmur at the pulmonary area with* central cyanosis from birth points to pure pulmonary stenosis or to that more complicated congenital defect known as Fallot s tetralogy

A third heart sound heard inside the apex beat in children is of no pathological significance Nor is reduplication of the first sound at any age Reduplication of the second sound at the pulmonary area, however, points to pulmonary hypertension due to mitral stenosis emphysema or pulmonary embolism Much more important is the loud third heart sound sometimes heard over the praecordium of an adult and associated with tachycardia and a typical cadence known as gallop rhythm For this may be the first sign of congestive failure Further, in advanced heart disease *pulsus alternans is not uncommon* The alternation of the force of the beats (all regularly spaced and sino auricular in origin) can seldom be detected by palpation of the radial pulse but is easily diagnosed on taking the systolic blood pressure, the height of which may alternate by several millimetres of mercury

When beats are missed at the wrist, listening over the patient s heart usually reveals a premature beat i e an extra *systole, too weak to get through to his radial pulse* but accounting for the next normal beat at his wrist being missed When no such extra beat is heard he must be suffering from the true missed beats of partial heart block and a regular ventricular rate below 40 is pathognomonic of complete heart block Far more often the heart is beating too fast

into the veins of the neck means a rough aortic valve and a rough aortic valve an organically diseased one If there is a palpable thrill, and the left ventricle is hypertrophied and the systolic blood pressure low, the aortic valve must also be stenosed A soft diastolic murmur conducted down the left side of the sternum, a low diastolic pressure and hypertrophy of the left ventricle, mean that it must be incompetent If both murmurs are present the valve must be both stenosed *and* incompetent In rheumatic heart disease aortic are often associated with mitral lesions and aortic complicated by the coexistence of mitral murmurs

A loud systolic murmur over the pulmonary area in an infant is likely to be due to congenital pulmonary stenosis In an adult it is most unlikely to be of any organic significance Murmurs of this kind are very common and no one knows how they are produced although they tend to occur in anaemia and constitute one variety of ' haemic murmur

Mitral systolic murmurs, too, are often of no organic significance occurring in and remaining unchanged throughout life in fit people On the other hand, like pulmonary murmurs they tend to occur in anaemia, when again they are said to be ' haemic,' and often develop in the course of acute infections, possibly due to transient dilatation of the muscular ring on which the mitral valve is built The are also common in systemic hypertension (again it is not known why) and under those circumstances must not be taken to mean that the mitral valve is necessarily incompetent Against the background of acute rheumatism however (in view of the high probability of valvular disease under these circumstances) a mitral systolic murmur is likely to be organic A loud, harsh one conducted through to the back at the angle of the scapula, particularly if it is associated with a palpable thrill, means well established mitral incompetence a softer rapidly developing one that the *mitral valve is becoming rapidly incompetent*

A mitral presystolic (auriculo systolic) or a late or mid diastolic murmur heard over and limited to the mitral area is diagnostic of mitral stenosis For practical purposes it always means that and nothing else and explains the shortness of breath of which the patient came complaining For, although mitral stenosis does not handicap the left ventricle like mitral

When his eyes are also puffy his oedema is unlikely to be cardiac in origin, cardiac oedema being of the gravitational kind, i e *developing in the most dependent parts of the body,* in the feet on standing, in the lumbar region and sometimes round the elbows when in bed Non gravitational oedema, as evidenced by swelling of the eyes, must be due to sudden liberation of histamine in the tissues, due to a local allergic reaction or to renal disease If the oedema of his eyes is allergic, one eye alone may be affected, patches of it may suddenly *appear elsewhere, on the tongue for example,* and his urine is normal If it is renal his urine will contain albumin and renal disease can lead to oedema in three ways If it came on suddenly with haematuria, albuminuria and hypertension it must be due to acute nephritis although the mechanism of its patho genesis in that disease is not really understood If it developed slowly the urine boiling almost solid with albumin, it is due to hypoproteinaemia and reduced osmotic pressure of the plasma If the blood pressure is raised it may be due in part to chronic congestive failure and under these circumstances the face is not likely to be oedematous

When oedema cannot be explained in terms of congestive cardiac failure or renal disease (these conditions will naturally cross the mind first on account of their importance) some other explanation must be sought An infected wound would suggest the possibility of hypoproteinaemia due to loss of plasma protein in the discharge, a period of starvation or evidence of cirrhosis of the liver, hypoproteinaemia due to failure of formation of it the fact that the patient was on cortisone or A C T H or evidence of Cushing s syndrome retention of sodium chloride Nevertheless these are all rare causes of oedema Most cases when cardiac failure and renal disease have been excluded, prove to be due to local mechanical factors

Oedema of one limb always suggests local obstruction of either the venous or lymphatic drainage from it Thus oedema of an arm with signs in the chest suggests an aneurysm or an intrathoracic new growth coming on after amputation of a breast reduction of the lymphatic bed after X ray treatment, *reactionary fibrosis blocking lymphatic channels* Oedema of one leg coming on during rest in bed particularly after an

and rapid regular action of it may be simple (sino auricular) or paroxysmal (ectopic) In the former the cause is usually obvious, fear, fever, exercise or thyrotoxicosis The latter comes on unaccountably, usually when the patient is at rest Further, there is a peculiar mechanical regularity about it and the rate is usually above 140, a rate rarely reached by tachycardia of sino auricular origin Complete irregularity of ventricular action must be due to auricular fibrillation but it is sometimes difficult to distinguish between it, very frequent extrasystoles and auricular flutter with varying degrees of AV block, without instrumental aid The irregularity of auricular fibrillation becomes more marked with exercise however, while extrasystoles tend to disappear and the irregularity of flutter to remain unchanged In the majority of cases the completely irregular pulse proves to be due to auricular fibrillation

Oedema and Ascites

White puffy swelling which pits on pressure, that is to say remains indented after the tip of the finger has been withdrawn, must be due to pathological accumulation of fluid in the tissue spaces, and this condition, oedema, may be caused by a number of different functional disorders

When a patient says that his feet swell after he has been about on them all day, but that they go down" after a night in bed, his oedema (for that must be the nature of the swelling of them) is most likely to be due to congestive heart failure Nevertheless, this interpretation of its cause is only likely to be correct if signs of raised venous pressure can be found His jugular veins should be visible in his neck when he is in a semi recumbent position (they normally collapse when he begins to sit up) and may even still stand out when his body is upright His liver, too, should be palpable, soft and tender, due to venous congestion, and in an advanced case his urine is concen trated, deposits urates on standing and may contain a trace of albumin, due to venous congestion of his kidneys Further, some cause for his heart failing will usually be discovered He will be found to be suffering from systemic hypertension or mitral or aortic disease, in which case signs of oedema will be found in his lungs, or from primary right heart failure due to emphy sema

systemic and portal venous systems and clinch the diagnosis of gross mechanical obstruction of the portal vein In the absence of splenic enlargement and other evidence of cirrhosis, ascites is likely to be due to peritoneal irritation Palpable masses would suggest irritation by secondary new growth, fever by acute infection Further following a history of acute abdominal pain in a febrile patient free fluid in the abdominal cavity is likely to be due to a combination of perforation of his gut and acute infection of his peritoneum

Distension of the abdomen may also be due to gaseous distension in organic obstruction and paralytic ileus (page 262) and to large solid masses

Palpable Masses

When a patient discovers a lump in his own body or one is found on routine examination of him where no lump ought to be two questions arise immediately Where does it come from? What is its physical nature? These must be answered before its pathological cause can be diagnosed with any feeling of certainty

To answer the first question some knowledge of the potential lump and mass producing organs in different parts of the body is required In the middle line of the neck a lump is likely to originate in the thyroid at the side of it, above the clavicle or in an axilla or groin in a lymphatic gland A mass felt under the left costal margin is most likely to be the spleen, but it may originate in the left lobe of the liver or left kidney or even in the stomach or colon Similarly on the right side it is most likely to be an enlarged liver, but it may be an enlarged gall bladder or the right kidney or originate in the hepatic flexure of the colon In a man a mass rising out of the pelvis is likely to be a distended bladder and will usually disappear, or anyhow get smaller, when he passes his urine In a woman it is likely to be an enlarged uterus or an ovarian tumour and to be associated with some disturbance of menstruation

Its shape will sometimes help For example the liver has an edge and the spleen a notch Glands are round and often scattered and multiple but a number may get matted together in a single irregular mass Some organs move characteristically, an enlarged thyroid with swallowing and the liver, spleen and

attack of pain in it, is likely to be due to obstruction of the deep veins by thrombosis, of both legs, to obstruction of the inferior vena cava by thrombosis or to the pressure of an abdominal mass Under these circumstances the superficial veins will often be dilated The blood is flowing *up* in them, their dilatation serving a functional purpose They are carrying the venous load which should be carried by the deep veins Or the patient will be found to be suffering from ordinary varicose veins, the blood flowing *down* them, increasing the load which the deep veins must carry up Further, many of these patients are women who have had children, and many of them have had deep thrombosis in the past In short, a large number of patients who complain of chronic oedema of one or both legs prove to be suffering from the combined consequences of varicose veins, partially canalized old thrombosis of deep veins and the mechanical strain of prolonged standing necessitated by the circumstances of their lives

Fullness of the abdomen with dullness in the flanks, shifting to the lower side when the patient is turned, suggests free fluid in the peritoneal cavity (ascites) Eversion of the umbilicus and a fluid thrill mean that a large quantity has collected already, white striae in the abdominal wall that it has been there a long time Fluid which does not shift with the patient s position must be limited by peritoneal adhesions or have been generated in a cyst

When a patient has had cardiac or renal oedema previously, ascites, when it develops, is likely to be due to oedema of his peritoneal cavity and to venous congestion or to hypoproteinaemia respectively When it preceded or is clearly out of proportion to the oedema of his feet, some different mechanism must be responsible for it If his liver is enlarged, but his spleen cannot be felt, he is probably suffering from cardiac cirrhosis of his liver due to organic tricuspid disease or constrictive pericarditis *If his liver is not palpable*, but his spleen can be felt, he is probably suffering from thrombosis of his portal vein If both his liver and his spleen can be felt, he is probably suffering from portal cirrhosis of the liver and portal hypertension Visibly distended veins over the anterior abdominal wall, sometimes radiating from the umbilicus (the so called *Caput Medusae*), point to anastomotic communication between the

with that on the other side or a normal joint) although wasting of muscles, often largely due to disuse, exaggerates this appearance

If the swelling outlines the attachments of the synovial membrane (as so frequently in the case of a knee) it must be due either to thickening of it or to fluid in it In the former the swelling will feel of doughy consistency, in the latter fluctuate, and in the case of a knee joint, by pushing the fluid down from above even when only a little is present the patella can be made to tap against the underlying bone Further when a synovial effusion is due to *acute* synovitis a joint is held in that position which allows maximum volume and therefore results in minimal pressure and least pain, in acute synovitis of the knee, for example, in partial flexion If the joint feels hot the fluid must be blood or pus if cool, probably serous exudate Local swelling in the neighbourhood suggests a protrusion of the synovial membrane through the capsule, a ganglion on a nearby tendon sheath accumulation of fluid in a neighbouring bursa and occasionally an abscess originating in the bone

When, on the other hand, a joint feels tough, swelling of it is likely to be due to thickening of its capsule rather than of its synovial membrane, and when it feels bone hard it must be due to over growth of bone In both cases the mobility of the joint is likely to be limited, in the former by contraction of the capsule and other ligaments after the stronger muscles acting at it have pulled it into 'their position, in the latter to bony out growths If it is completely fixed the articular surfaces must be cemented together by fibrous tissue (fibrous ankylosis) or have grown into one another (bony ankylosis) Only an X ray will decide this point and at the same time throw light on the pathological process likely to be responsible for it Grating in a joint (crepitus), a very common finding means thickening of the synovial fringes Sudden locking of a joint is due to one of them acting as a foreign body or, following an injury due *to displacement of a cartilage, although this only* ever happens in the knee A swollen joint with limited or a completely disorganized one with increased mobility, which is surprisingly painless is probably trophic and due to disease of the nervous system either tabes dorsalis, which tends to affect the larger joints, or syringomyelia which tends to affect

kidneys with respiration Percussion sometimes helps Most abdominal masses are dull, being solid or cystic, but an enlarged kidney is covered by resonant gut (which may help to distinguish it from a large liver or spleen) and a resonant lump in the groin in the scrotum or in Scarpa's triangle must be a protrusion of gut, that being the only abdominal organ which contains air A hernia can often be pushed back to return on straining or coughing A hard, irregular, non tender mass is almost certainly of solid matter A collection of fluid is soft and round and fluctuates, that is to say, pushed in at one place it rises in another, for the simple reason that fluid cannot be compressed But, as the pressure in it increases, it approximates in shape to a sphere, the solid figure which has maximum volume in relation to its surface area Further, it may now become so hard that fluctuation can scarcely be elicited A painful red swelling, with fever and sweating, suggests a collection of pus, a non tender one without constitutional symptoms, a cyst or a cold (tuber culous) abscess An expansile swelling in the line of an artery can only be an aneurysm

Most important are any symptoms or other physical signs with which a lump is associated For example, a thyroid swelling is likely to be associated with thyrotoxicosis and an enlarged spleen with anaemia Vomiting suggests that a swelling in the upper abdomen is due to distension of the stomach, in which case peristalsis is often visible travelling from left to right and a splash is audible on palpation When a hard lump is felt in the epigastrium, vomiting may suggest that it originates at the pylorus, or diarrhoea that it originates in the colon Under these latter circumstances the abdomen is some times distended and resonant and peristalsis may be visible travelling in the right to left direction Pathological enlargement of a kidney is almost invariably associated with albumin in the urine and of the uterus with amenorrhoea or menorrhagia Masses can also often be felt *per rectum* and *per vaginam* when they cannot be felt through the abdominal wall These examinations are particularly important in the diagnosis of pelvic conditions

Swollen Joints

A joint may look swollen merely owing to wasting of the muscles round it Far more often it is swollen (in comparison

movements at the most peripheral joints is almost certain to be due to an upper motor neurone lesion For example, when a man cannot use his hand, and on examination all movements at his elbow are also found to be weak (but those at his shoulder are little affected) some pathological process must have picked out the corresponding fibres of his pyramidal tract somewhere between their origin in his motor cortex and their termination round the anterior horn cells in his spinal cord on the opposite side For the pyramidal tract actuates co-ordinated movements the patterns of which are latent in the motor cortex, the lower motor neurones merely operating the individual muscle groups which co-operate in the performance of them Further, in long standing upper motor neurone lesions the paralysed muscles are spastic and the tendon jerks increased, and in the case of the leg ankle clonus is present and the plantar reflex extensor in type as in the infant before the myelination of its pyramidal tracts In a sudden upper motor neurone lesion, however, some time *elapses before spasticity develops (it may be months before an* arm or leg is fully spastic), and the tendon jerks do not return immediately Hence the importance of the extensor plantar *response (Babinski s sign) in diagnosis Not only is it a certain* sign of failure of function of a pyramidal tract but it is the first convincing one of it in an acute and usually the first sign of it to *develop in a chronic case*

The next question is the site of the lesion and this one is seldom difficult to answer, the distribution of the paralysis providing the clue to it in most cases Sometimes a single limb only is affected monoplegia If it is an arm or hand the lesion must be in the cortex if a leg, in the cortex or low down in the spinal cord Hemiplegia means that the lesion must be sub cortical It would need to be very extensive in the cortex to involve the centres for both arm and leg but lower down in the brain stem all the fibres to them from one side are gathered together in the internal capsule Similarly quadriplegia paralysis of this type affecting all four limbs (continuing to reason on these lines), is only likely to be due to a lesion *below* the point where the pyramidal tracts from the motor cortex on each side converge and *above* the point at which the lower motor neurones come off the cord to supply the arms So it can only be in the brain stem or the cervical region Paraplegia, on

the smaller ones Finally, the distribution of swelling of joints by throwing light on the pathological process responsible for them often reveals the likely structural and functional mechanism of their enlargement or deformity

Paralysis

When a patient complains that he cannot move a limb properly, or an infant obviously does not do so, it may be due to pain (pseudo paralysis) or to some recently acquired muscular, bone or joint deformity Under these circumstances local tenderness, swelling or other physical signs will be found to account for it Far more often the limb, hand or foot is normal and the trouble lies in the innervation of its muscles The patient is suffering from paralysis

When he has difficulty in effecting a certain movement at a joint, or cannot effect it, for example, dorsiflex his foot (foot drop), so that he drags his toes walking or in a bilateral case is compelled to proceed with a high stamping gait, or cannot raise his hand when pronated (wrist drop) and cannot grasp things firmly, some pathological process must have interfered with the lower motor neurones supplying the muscle groups on which these movements depend This functional interpretation will be confirmed if the paralysed muscles are flaccid and the tendon jerks which depend on them cannot be obtained In a case of some standing they will also be wasted and the unopposed action of the antagonistic muscles will have pulled the limb hand or foot into some abnormal position in which it has now become fixed by changes in the joints For example, paralysis of the anterior tibial muscles results in the deformity of the lower leg and foot known as talipes equino varus In the absence of spinal signs the lesion may be in the cord, as in poliomyelitis in the absence of sensory symptoms in the motor nerve roots (radiculitis) Pain of a segmental distribution would however point to involvement of a 'mixed nerve This has been injured or the patient is suffering from some form of peripheral neuritis But the motor constituents of a peripheral nerve are sometimes picked out, all the sensory ones escaping, with the result that even in peripheral neuritis paralysis may be painless

Weakness of a whole arm or leg with the main emphasis on all

Involuntary Movement

Movement of some part of his body which the patient can not control is a not uncommon symptom and can usually be quickly confirmed as a sign

Sometimes it is clearly a co ordinated one involving the co operation of several muscle groups Then, if it is of a pur posive kind and exactly the same movement is repeated again and again it must be a tic or habit spasm If, on the other hand it is non repetitive, i e it is impossible to forecast what movement is coming next, it must be chorea which is also associated with hypotonia muscular weakness and a characteristic posture of the hand in consequence Sometimes it is of hemiplegic distribution Another much less common variety of involuntary movement is myoclonus In this condition it is always of the same kind on each occasion as in tic, but it is not purposive Rather it is often very strange indeed For example, it may involve the eyes (oculo gyral crises) leading to sudden violent squint and diplopia, or the muscles of respiration the latter sometimes to such an extent as to lead to over breathing, alkalosis and tetany Cases of this kind are usually the consequence of an encephalitic process, and a history of some mysterious illness preceding its onset will usually be obtained Others may be due to epilepsy of a focal kind without loss of consciousness Indeed no absolute dividing line can be drawn between myoclonus and epilepsy

Tremor due to the rapid alternating action of agonistic and antagonistic muscles is much more common and is easily recognized Rather, the question often difficult to decide is the mechanism producing it Sometimes it is a congenital disorder and there may be a family history of it Far more often it is nervous and a fine tremor of the outstretched hands is charac teristic of thyrotoxicosis presumably a manifestation of the highly nervous state that accompanies over secretion of thyroxine (If due to this cause other physical signs are almost certain to be present) An intention tremor is also characteristic and invariably due to cerebellar dysfunction a tremor at rest, which disappears on intention, due to disease of the basal ganglia A curious squirming movement, athetosis, also points to a lesion in the basal ganglia and is often associated with a

the other hand, i e paralysis of both legs (the arms escaping), may be due to a lesion over the vertex of the brain where the two leg centres lie close together (the arm centres lie much farther apart), but is much more often due to a lesion of the spinal cord below the point at which the fibres to the arms leave it In the former the legs are spastic in extension, *i e in normal* useful posture, the lesion being above the point where the extra pyramidal motor fibres start In the latter these are intercepted as well as the pyramidal fibres, and spasticity is of the spinal type, *i e the paraplegia is in flexion*, the paralysed patient curling up in bed

When no signs can be found in the nervous system weakness may be due to disease of the muscles themselves They are commonly weak, for example, in rheumatoid arthritis Primary muscle disease is, however, rare and in most cases genetic and familial in origin, a fact helping more than any other to reveal the diagnosis Indeed, the only acquired disease of muscle leading to weakness is dermatomyositis and in this condition physical signs are to be found, not only in the muscles, but also in the skin over them

When no signs of disease can be found either in the nervous system or in the muscles, paralysis is likely to be psychogenic, a product of the mind rather than the result of disease of the body Further, under these circumstances it fails to conform to the pattern of that typical of either an upper or a lower motor neurone lesion Rather, it is the patient s own idea of what paralysis should be like and that is often odd An arm, for example, is sometimes held in some fantastic position Hysterical paralysis is also characteristically *effected by putting all the* muscles of a limb into action in opposition to each other *All* the muscles can be felt equally stiff and rigid and when relaxa tion is obtained, as it often can be by distracting the patient s attention, the tendon jerks are normal, the abdominal reflexes present and the plantar reflexes flexor, findings which dis tinguish spurious from true spasticity Moreover, there is the self centred personality of the patient and often the patently obvious motive for his paralysis In many the stigmata of hysteria, notably anaesthesia of conjunctivae, fauces and skin, are present to support the diagnosis

Involuntary Movement

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Sometimes it is clearly a co ordinated one involving the co operation of several muscle groups Then, if it is of a pur posive kind, and exactly the same movement is repeated again and again, it must be a tic or habit spasm If on the other hand it is non repetitive, i e it is impossible to forecast what move ment is coming next it must be chorea, which is also associated with hypotonia muscular weakness and a characteristic posture of the hand in consequence Sometimes it is of hemiplegic distribution Another much less common variety of involuntary movement is myoclonus In this condition it is always of the same kind on each occasion, as in tic but it is not purposive Rather it is often very strange indeed For example, it may involve the eyes (oculo gyral crises) leading to sudden violent squint and diplopia or the muscles of respiration the latter sometimes to such an extent as to lead to over breathing, alkalosis and tetany Cases of this kind are usually the conse-quence of an encephalitic process, and a history of some mysterious illness preceding its onset will usually be obtained Others may be due to epilepsy of a focal kind without loss of consciousness Indeed, no absolute dividing line can be drawn between myoclonus and epilepsy

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corresponding defect in speech This sometimes seems to squirm like the patient's hands In other cases his speech is unaffected but his arm may writhe about to such an extent on this account that he is compelled to hold it with the other hand in order to control it

Disorders of Peripheral Sensation

Numbness and tingling in a certain part of the body point to interference with the function of the nerves from it This may be due either to failure of their blood supply (or the return of blood to them after a period of ischaemia as in a leg 'going to sleep'') or to disease of them somewhere in their course In ischaemia signs of failure of blood supply to that part of the body will be discovered, diminished arterial pulsation, turning white on being held up, blue on being allowed to hang down, and perhaps the early signs of gangrene In disease of nerves signs will be found on examination of the nervous system

The sense of light touch (cotton wool) is rarely lost Loss of the sensation of pain is more important and the patient may have discovered it himself More often he complains of numbness or tingling in a certain part of his body, the blood supply of which is good, and his anaesthesia is discovered on routine examination and testing his capacity to feel the point of a pin This area must now be mapped out accurately It may correspond to the distribution of a peripheral nerve, to that of a cord or trunk of the brachial or lumbo sacral plexus, or to that of a spinal nerve root Further, anaesthesia is sometimes associated with intense pain in the same area due to pathological stimulation of the central ends of the fibres the continuity of which has been interrupted When, however it fails to correspond to the distribution of a nerve, trunk or spinal root, or several spinal roots together, when for example it is of glove or stocking type or affects one whole side of the body including the face, it must be psychogenic

Seldom does a patient realize that he has lost his sense of position although he may come complaining of the disorder of function often associated with it, namely incoordination of movement (ataxia), manifest as difficulty in walking straight and standing with the eyes shut Or he may come complaining of sexual anaesthesia and impotence or bladder anaesthesia and

incontinence, impulses underlying these sensations also travel ling up in the posterior columns of the cord But, whether or not he complains of symptoms of this kind, it is always important to test for sense of position because while anaesthesia to pain is often hysterical, loss of sense of position and vibration (which travels with it) is invariably organic (The ordinary person never thinks in terms of these sensations and so the subconscious mind never adopts loss of them as symptoms) Further, the posterior columns of the cord are far more often affected by organic disease than the lateral columns in which pain travels Appreciation of form and shape in three dimensions depends on the cortical interpretation of sense of position and this should be tested whenever a cortical lesion is suspected

A patient who comes complaining of difficulty in walking may be suffering (muscle, bone and joint causes having been excluded) from paraplegia or a bilateral lesion of the posterior columns of his cord Physical examination will differentiate between them although in certain pathological conditions they may occur combined In paraplegia movement is weak but the legs spastic, the tendon jerks increased, the plantar reflexes extensor and the urine retained In posterior column lesions the muscles are flaccid (and weak to some extent on this account) the tendon jerks absent the plantar reflexes flexor, sense of position and vibration lost and the patient incontinent of urine and impotent When they occur together the patient s physical signs depend on the relative extent to which the two systems are involved When both are entirely out of functional action, hypotonia, due to the posterior column lesions, over rides spasticity, due to the pyramidal lesions the tendon jerks are lost and the only signs of the latter are the extensor plantar responses

When a patient complains of difficulty in using his hands to execute fine movements he is more likely to be suffering from some disorder of his cerebellum For the perfect co-ordination of movement depends not only on information supplied up the posterior columns to consciousness but also on unconscious cerebellar function He will be found to have an intention tremor he cannot raise a cup to his lips without spilling its contents or pick up a pin without fumbling When tested, he

may exhibit dysdiadochokinesis And yet his sense of position is normal and however much he uses his eyes to attempt to guide the movement of his hand, it helps him little Further, the muscles moving his eyes and those concerned with his speech are invariably affected in cerebellar ataxia So the latter is staccato, lacking rhythm, coming out explosively, and on examination of his eyes he will be found to have lateral, vertical or rotatory nystagmus

Local lesions of the spinal cord lead to composite disorder of movement and sensation Paraplegia, loss of sensation of all kinds and retention of urine with overflow mean that the function of the spinal cord has been completely interrupted, loss of the sense of pain, heat and cold on one side with loss of sense of position and pyramidal function on the other (the Brown Sequard syndrome), anatomical or functional hemi section of it Loss of heat and cold on both sides, with some loss of the sense of pain, but none of position or light touch, points to a lesion in the neighbourhood of the central canal where the fibres carrying impulses underlying these sensations decussate in their upward journey to the brain

Not Talking Properly

When a patient cannot utter spoken words aloud his vocal cords cannot be functioning properly but if he can cough normally his aphonia must be hysterical, a symptom adopted by his unconscious mind and failing to ring true ' (The ordinary person does not associate coughing and phonation, the former usually fired off reflexively, the latter initiated voluntarily) When he can neither phonate nor cough, his laryngeal mechanism must be organically diseased If he has signs in his chest, particularly those of mediastinal obstruction, i e venous congestion of his head and neck, oedema of one arm visible veins over his chest, one of his recurrent laryngeal nerves is probably involved his vocal cords themselves being normal If his chest is clear, his vocal cords are more likely to be diseased, but only laryngoscopy will finally decide this point If one cord is now seen not to move, or to be adducted when he attempts to phonate, his other being drawn across the middle line towards it that cord is paralysed

When a patient can phonate but cannot speak his words

distinctly, he is said to be suffering from dysarthria This may be due to some structural defect of his mouth, for example, cleft palate He will have had a nasal voice from birth and the diagnosis will be obvious on looking inside his mouth Some degree of it is also inevitable after a person has had a number of teeth extracted and is likely to persist until proper dentures are fitted *Dysarthria may also be due to organic disease of* the neuro muscular machinery on which the execution of spoken words depends A slurring speech suggests some fault in the motor cortex where the impulses underlying words to be spoken are initiated slow speech and a blank expression, extra pyramidal motor disease If the patient cannot put out his tongue, dysarthria is likely to be due to paralysis of his hypoglossal nerves and this is usually part of a bulbar palsy More often it proves to be due to failure of co ordination Explosive staccato speech, sentences which come out in jerks the patient s speech lacking rhythm, as has been seen already, suggests failure of cerebellar function

When a patient can speak aloud and distinctly but has *difficulty in finding his words or uses the wrong ones to express* what he obviously wants to say with the result that he talks an incomprehensible jargon, there must be something wrong with the speech centre in his brain So he should be asked to name common objects and if he now calls a pen a key or a cup, a plate for example he is clearly suffering from aphasia Some times he cannot read (alexia) although he can understand the meaning of spoken words, or cannot write (agraphia), although he can read Sometimes he cannot understand the meaning of either spoken or written words Indeed, there are many varieties of aphasia all due to lesions of the speech area but exact localization of them is usually impossible When he cannot speak, although he clearly understands what is said to him can read and may be able to write down what he wants to say the lesion is subcortical and as would be expected, frequently associated with weakness of the right hand or hemiplegia on the right side in a right handed person

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has elapsed since then conforms to the known incubation of measles or chicken pox, there is little doubt about the diagnosis

Seldom, however, is clinical diagnosis quite so easy Rarely does the history give away the nature or are the physical signs typical of any one particular pathological process How then is diagnosis done? On the principle, which should now be clear from previous chapters, that different pathological processes often tend to affect human body mind at different ages and one sex more often than another (quite apart from the peculiar risks to which men and women are respectively exposed) and again and again tend to produce characteristic combinations of altera tion of structure and disturbance of function from which their presence can be inferred with reasonable certainty

A few examples will make this principle clear A rash of a certain type in a child is likely to be measles, the same rash in a man, particularly if he has had measles, due to secondary syphilis Pyloric stenosis in an infant is always congenital in an adult due either to simple ulcer or new growth Congenital pyloric stenosis occurs practically only in male infants Thyro toxicosis is commoner in women carcinoma of the lung and cardiac infarction commoner in men The consequences of high blood pressure are more serious in males Strychnine causes typical convulsions The virus of poliomyelitis leads to paralysis of the lower motor neurone type that of hepatitis to catarrhal jaundice Acute specific rheumatism affects the mitral and sometimes the aortic valve Syphilis affects the aortic but never the mitral valve and also involves the aorta being the only cause of a large aneurysm Tuberculosis affects the lungs but never the endocardium Both diseases affect the brain, although syphilis much more often than tuberculosis Tuberculous infection of the body runs one characteristic clinical course and syphilis another Carcinoma of the colon and stomach are common primary carcinoma of the liver and small gut very rare indeed Secondary carcinoma of the liver is common, of the spleen almost unknown

While therefore the interpretation of symptoms and signs merely demands some knowledge of anatomy and physiology, the diagnosis of their pathological cause again and again turns on a wide and intimate acquaintance with the apparent habits of disease processes Further although our knowledge

WHAT PATHOLOGICAL PROCESS?

The next step in diagnosis, after having thought out the most probable explanation of the patient's symptoms and signs in terms of alteration of structure and/or disturbance of function (of which sufficient examples have now been given), is, as already pointed out, to think out the most probable pathological process or primary functional disorder likely to be responsible for them. Here we collide with the same kind of difficulty as in the interpretation of symptoms. Just as the same symptom or sign may be due to one disorder of function in one patient and to another disorder of function in another, so the same disorder of function may be due to one pathological process in one patient and to another pathological process in another. For example, just as shortness of breath may be due to valvular disease of the heart or to reduction in the vital capacity of the lungs, so valvular disease of the heart may be congenital, rheumatic, syphilitic or atheromatous, and reduction of the vital capacity of the lungs due to inflammation, new growth or the degenerative processes of advancing age. Loss of voice, which must mean failure of function of the larynx, may be caused by mustard gas poisoning, tuberculosis, cancer, hysteria, extension of an ordinary cold down the trachea or merely shouting at a football match. Indeed, few pathological processes lead to distinctive alterations of structure or disturbances of function and parade characteristic symptoms and signs of which they possess a monopoly and by which they can be recognized with certainty.

Sometimes the pathological process *is* obvious from the patient's history or the circumstances of his life. For example, a murmur discovered on routine examination after birth must mean congenital malformation of the heart. When a fracture follows a sufficient accident, there is no need to postulate any primary disease of bone. When loss of weight follows starvation, it is almost certainly due to loss of body substance and, after vomiting, almost certainly due to loss of body water. When an empty bottle of tablets is found beside the bed of a person lapsed deeply into coma, he is almost certain to be suffering from chemical poisoning. When a child with fever and a rash is known to have been exposed to infection, and the time which

can be discovered when they first start to complain of symptoms So again and again the diagnosis of organic disease in general, and of early organic disease in particular, returns to the history, that is to say, it depends on the patient s subjective sensations, the way in which they evolved and any peculiarities which he has noticed in the rhythmic behaviour of his body

One good rule stands out The onset of symptoms against a background of good health at any age, and particularly in men and women over forty, usually means the onset of organic disease Further, the symptoms of it invariably make sense, that is to say, they are usually related to demand on physical function and conform to the kind which a pathological process in a certain part of the body would be *expected* to produce For example when a man starts to develop a duodenal ulcer, he begins to complain of pain in his epigastrium as he gets hungry and the concentration of acid in his stomach starts to rise, when his coronary arteries begin to degenerate, he starts to complain of pain in his chest on exertion relieved at once by rest Similarly, with bodily events A new cough, abrupt loss of consciousness, blood in normal stools and any rather sudden alteration in the way of working of the bowels or bladder must all be taken seriously as likely to mean the onset of organic disease

When a patient complains of symptoms of a mental kind, organic disease must be excluded before any other diagnosis is considered In infancy failure of the development of the mind may be due to mongolism or cretinism in later childhood to congenital syphilis In adult life moral deterioration may be due to secret drug addiction and confusion to hypoglycaemia or drunkenness In most cases of organic psychosis, i e dis order of mind due to some *known* pathological process of the body affecting the brain, some physical signs will be discovered although they may be very slight as for example in an early case of general paralysis of the insane or an early tumour affecting a frontal lobe Nevertheless, even when physical signs are absent, the pattern of the patient s mental symptoms will usually keep the clinical diagnosis straight and suggest the advisability of investigation along organic lines Alteration of personality or behaviour and failure of memory and mental capacity always raise the probability of an organic psychosis even in the absence of definite physical signs

of this kind accumulated down the years can be found in books, the fact remains that disease is always changing, and success in clinical diagnosis demands, not only book knowledge, but first hand personal experience of disease, as it stands today, and particularly of its common manifestation in the district where the doctor works

Organic Disease?

In every case organic disease must always be excluded first It may be disastrous to mistake organic disease for a primary functional disorder Indeed, it may result in missing the fleeting therapeutic opportunity with very serious consequences to an individual human life

Some fact in the patient's history or the circumstances in which he is encountered may settle this point at once On the other hand, there may be no convincing lead to be gained from the history Then physical signs often settle it Nevertheless all physical signs do not mean organic disease For example, rapid action of the heart may be emotional rather than organic, copious sweating due to fear rather than to fever, loss of weight and diarrhoea to anxiety rather than to steatorrhoea or carcinoma of the colon, increased tendon jerks to mental tension rather than to bilateral disease of the pyramidal tracts

Certain signs spell organic disease, however, with absolute certainty, although not necessarily of any serious kind Hence their pride of place in diagnosis For example, pupils which react to accommodation but not to light, absent tendon jerks and persistent extensor plantar responses all mean organic involvement of the nervous system Enlargement of the heart, diastolic murmurs and complete irregularity of its action all mean that it is struggling with an organic handicap and not just being nervously over driven Dullness at a base, prolongation of expiration and adventitious sounds mean organic disease of the lung Glands, except in the groin, a palpable spleen, an enlarged liver, and a mass anywhere in the abdomen are always organic in origin

On the other hand the complete absence of physical signs does not rule out organic disease Rather, it is probably true to say that in a large proportion of patients, who subsequently prove to be suffering from organic disease, no physical signs

life Secondly, his signs and symptoms run parallel not with demand on physical function, but with his emotional state and therefore to the outsider' appear utterly erratic But an anxiety neurotic can develop organic disease like anyone else Then *neurotic and organic symptoms get hopelessly confused* and when this happens, it is very easy in the absence of physical signs, to make a serious mistake So again and again the whole expensive paraphernalia of X ray examinations, chemical analyses and electrical tests must of necessity be mobilized to exclude organic disease in a patient who comes complaining of symptoms which are almost, but not quite certainly, really psychoneurotic in origin

When a patient has adopted the symptoms and signs of disease in order to escape from something or to get emotional satisfaction the diagnosis is seldom very difficult For, unlike the anxiety neurotic, one of this type so obviously wants to keep his ill health, and the motive behind it all is so painfully obvious Moreover his symptoms never remit they must be there to justify him in his own eyes whenever he thinks about his behaviour Further hysterical symptoms rarely ring true The hysterical fit does not correspond to the pattern of epilepsy hysterical paralysis to either an upper or a lower motor neurone lesion, or hysterical pain to demand on any particular function For hysterical symptoms, as already explained are the product not of the body, but of the mind Indeed the only real difficulty arises when real physical symptoms are exaggerated for selfish purposes To what extent, for example is a certain patient really suffering pain from an old injury or getting giddy after a cerebellar thrombosis as he says? Questions like these may be difficult to answer and again and again the diagnosis turns on the right assessment of the patient s personality

Nevertheless every patient complaining of symptoms, but in whom organic disease has been excluded is *not* necessarily suffering from some psychoneurotic condition as is so commonly and erroneously supposed Indeed, when a patient is a stable, well adjusted person, and particularly if he has had symptoms of a certain kind unchanged for a long time, he is much *more* likely to be suffering from some primary constitutional weakness of his body rather than of his mind based on it For example,

When no physical signs can be found and the patient is clearly suffering from some disorder of affect (i e of his emotional rather than of his intellectual reactions), he is probably suffering from a psychosis, i e mental disease undoubtedly of an organic kind but without any structural change in the body that can be seen or is capable of leading to physical signs In a young adult moodiness, difficulty in establishing psychological contact with him, and emotional reactions out of relation to real events, suggest a schizoid tendency In a man of pyknic type depression is likely to be endogenous Mania, syphilis of the brain and drugs having been excluded, is invariably psychotic Nevertheless the differential diagnosis of the psychoses, forms of organic disease, from the psychoneuroses, primary functional disorders, turning as it needs must on psychological symptoms and the behaviour of the patient, is often, particularly in early cases, very difficult indeed

Primary Functional Disorder?

When a patient's intellectual and emotional reactions are geared at normal level but he or she is 'all of a dither," picking up one idea of disease or fear of disaster after another, and sometimes clearly incapable of living happily or coping successfully with the problems of everyday existence, he or she is in a state of anxiety or suffering from an anxiety neurosis Others of this sort complain of physical symptoms These are diagnostically more difficult For the symptoms which anxiety of mind produce *can simulate those which organic disease of the* body can produce very closely indeed For example, fatigue due to mental turmoil may suggest physical fatigue due to anaemia, sweating due to over stimulation of the sympathetic, recurrent bouts of fever, irregular action of the bowels due to *nervousness*, organic disease of the colon The idea of blood pressure may lead to headache, of heart disease, to pain in the chest of cancer, to pain in the stomach

So the same problem crops up again and again *Is this rather* nervous person really suffering from organic disease? And how is this point settled? First, physical symptoms born of an anxiety state or a true anxiety neurosis rarely come 'out of the blue sky' of previous perfect health The patient has usually *been unstable in* body and mind (often labelled delicate) all his

PART V

Principles of Prevention and Treatment

The infant at birth is the result of "nine months work" on the genetic plan which was laid at its conception and vested in it still, by virtue of that plan, is the potentiality of growing up into an adult man or woman and that of maintaining itself in health for many years Vested in it too is the potentiality of developing an individual mind under the stimulus of conscious experience Clearly, however, the limit of its physical and mental development is set by the genetic plan whence it is derived Development of body and mind cannot get further than they permit even in the very best environment, and if there was an actual fault in the plan (or the environment *in utero* was adverse), the child is born with or grows up with physical disease or fails to develop mentally On the other hand, the standard of physical health and mental development ultimately achieved also depends to a very large extent on the physical and mental environment in which the child grows up that during the early formative years of body and mind being particularly important Further an infant is born without fixed habits These must be developed under the stimulus of training and education

CONGENITAL DEFECTS

Genetic defects transmitted down the generations may be due to mutation of the genes Care must therefore be taken not to over expose the body, particularly the gonads, to X rays either for diagnostic or therapeutic purposes and men and women in industry must be adequately protected from all sources of it International agreement must be reached on the

under these circumstances, constipation, indigestion, headaches, insomnia are likely to be physical and should be treated accordingly Many, too, are obviously of poor physique and incapable of any sustained exertion But they get along all right if they live carefully The trouble comes if their environment is suddenly changed, for example, when a man of poor physique, accustomed to an office stool, is compelled to eat an army diet, suddenly mix with strangers and undergo a course of battle training Then the diagnosis is obvious Indeed, the constitutionally weak in body constitute a large proportion of the patients in any doctor's practice and, as their symptoms may resemble those of organic disease very closely, they, like anxiety neurotics, until their constitutional weakness is recognized, may cause him much anxiety Further, they tend to worry about themselves and so develop a secondary anxiety state, psychoneurotic symptoms now obscuring the physical weakness which was the primary cause of their trouble They also often start treating themselves, notably patients suffering from constipation and indigestion, often rendering accurate diagnosis still more difficult Many such patients are in fact suffering from interaction between primary physical functional weakness, secondary anxiety and the bad habits and indifferent way of life into which they have so often got

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when the other one wants a child or a further addition to the family

In practice only three conditions raise this problem on any serious scale (Most genetic conditions are too rare to matter) In epilepsy the answer is clear If there is a history of it on one side the chances of a child of that marriage developing it are one in fifty and most people are prepared to take that risk particularly as epilepsy is not a very serious physical handicap Deaf mutism is a more serious disability and, the risk of it having been explained to them, a married couple must make up their own minds In most cases of psychotic breakdown there is a history of mental instability on one or both sides of the family, but those in love are not likely to take considerations of this kind into account in getting married and probably quite rightly, not likely to take them into account either if they really want a child

A genetic defect cannot be undone but a child can be sheltered from any particular risk to which it predisposes it and, when it does succumb structural lesions and functional disorder can be treated symptomatically In haemophilia and osteogenesis imperfecta for example, it must be protected from physical injury and in the former antihaemophilic globulin should be injected intravenously whenever it is exposed to some particular trauma such as the extraction of a tooth In familial acholuric jaundice a complete symptomatic cure can be effected by splenectomy although the child remains potentially capable of transmitting the disease to the next generation In the other congenital anaemias all that it is possible to do for the patient is to give him blood transfusions when and as required Mechanical aids to locomotion may be of some value in Friedreich s ataxia and the muscular dystrophies, and the incidence of the attacks in familial periodic paralysis can be reduced by keeping the child on potassium An exostosis or a neuro-fibroma can be removed when it causes mechanical trouble but nothing can be done for Huntington s chorea, congenital cystic disease of the kidneys and most of the strange inherited disorders of metabolism and muscle

Other congenital abnormalities are due to adverse influences *in utero* spoiling the execution of, if not a perfect, at any rate a very reasonable plan, notably german measles, acquired

suspension of atomic and H bomb tests, although the dose of ionizing radiation to which the human race is subjected on this account is still a fraction of that derived from natural sources

Spontaneous mutation in animals, indeed any genetic predisposition to disease in them, is quickly bred out by natural selection (The incidence of it in nature must be low) Man, however, committed to the philosophy that every individual has the right to live" strives to keep the weak alive and of recent years has become increasingly successful with the result that the incidence of genetic disease must be high among the human race More and more of the unfit are surviving to transmit defects to their children or their children's children Some eugenic control of human mating is therefore often advocated, but in its extreme form is far removed from any thing for which society would stand and, even if society would stand for any control, it is doubtful whether enough is known about the inheritance of physical and mental characteristics to justify trying it yet Nevertheless, when there is a history of a serious inheritable defect in the family of one partner of a marriage, both partners should be aware of the risks of it turning up again and, if they think right, take this into account in planning their family

Genetic disease due to a dominant gene, and therefore one which tends to occur in each successive generation and to affect siblings, unless unimportant, for example, colour blindness, or easily treatable, for example, familial acholuric jaundice, must be taken seriously Married people should understand the chances of any child of theirs developing, for example, congenital cystic disease of the kidneys or one of the muscular dystrophies and take the risk with open eyes (When one child develops a dystrophy another child is likely to suffer from it too) Most inherited disease, however, is due to recessive genes and only recurs occasionally Under these circumstances most potential parents, when the statistical risk is explained to them (if they want children or another child), are prepared to take it and the doctor, primarily concerned with the health and happiness of his individual patient, can hardly advise otherwise Indeed, he may need to go further The existence of some recessive hereditary defect on one side of the family must not be used by one partner to a marriage as an excuse for not having children

succeeds but, if the infant continues to vomit and lose weight the muscle of the pylorus must be divided down to the level of the mucous membrane (Rammstedt's operation) to relieve the mechanical obstruction A similar operation (Heller's) is sometimes performed for achalasia of the cardia (in many cases a congenital condition although symptoms seldom supervene until adult life) if repeated dilatation with a bougie fails Hirschsprung's disease also demands surgery The gut at the junction of sigmoid colon and rectum (in which the neuro muscular defect responsible for the disorder lies) is excised completely and an end to end anastomosis performed

PRIMARY FUNCTIONAL DISORDERS

The prevention of primary functional disorders and the achievement of anatomical perfection, within the limits set by the genetic plan laid at conception largely depend on the provision of the right physical and mental environment for development and the inculcation of discipline during infancy, childhood and adolescence As soon as an infant is born regular hours of feeding and sleep must be instituted if it is to thrive and its mother is not to suffer As it grows up regular habits of defaecation and micturition must be encouraged if sphincter control is to be gained and constipation prevented Regular exercise and sleep must alternate if it is to develop physically Self discipline and moral sense must be inculcated if it is not to become a difficult child or grow up psychopathic But far too often, sometimes in consequence of failure on the part of those concerned to encourage right habits of body or mind or on account of the individual having failed to take the trouble to develop them for himself, or because genetic predis position in some unfortunate physical or mental direction was too strong for either to counteract, an individual grows up with or starts in later life to develop some primary functional disorder

Gastro intestinal Dysfunction

A patient suffering from functional indigestion has almost always got into the habit of treating himself long before he first seeks medical advice convinced that he is suffering from

syphilis and rhesus incompatibility Every girl should be *allowed* to get german measles in childhood and when a woman has not had it she must be protected from the risk of getting it at any time that she might become or might actually be pregnant Every pregnant woman should have her W R tested and treatment for syphilis started immediately if it proves positive She should also be Rh tested and if Rh−ve her husband must be tested too Then, if he proves Rh+ve, the level of Rh antibody in her blood should be watched from the sixth month onwards If it shows signs of rising fast, labour must be induced as soon as the child is viable More often it is safe to leave pregnancy until full term and then, if the child is born seriously anaemic, replace its Rh+ve blood temporarily with Rh−ve blood in the right group

Some congenital abnormalities at birth (whether genetic or acquired *in utero* is immaterial) demand almost immediate action for example, atresia of the oesophagus, imperforate anus, Siamese twins, and often raise difficult moral problems Better sometimes to let a child die naturally, and the parents start again, ' rather than strive too hard to keep it alive In others, for example, cleft palate, hydrocephalus and malformation of the heart, plastic surgery should be delayed until the optimum age for it In the lesser degrees of congenital heart disease (which demand cardiac catheterization for exact diagnosis) plastic surgery is sometimes postponed until the patient starts to complain of symptoms On the other hand, every persistent ductus arteriosus must be tied in adolescence, not on account of the risk of heart failure but on account of that of infective endocarditis Other congenital abnormalities are only diagnosed when, and therefore not removed until, they lead to mechanical accidents or infection for example, a Meckel's diverticulum when it leads to intestinal obstruction, a cyst in the lung when it becomes infected, an aberrant renal artery when it leads to colic, recurrent pyelitis or progressive hypertension

Congenital disorders of function are treated empirically when and as symptoms supervene In congenital pyloric stenosis atropine should be given before each feed to relax the pylorus and one hour afterwards the stomach must be washed out with saline to make sure that it is empty This treatment usually

succeeds but, if the infant continues to vomit and lose weight the muscle of the pylorus must be divided down to the level of the mucous membrane (Rammstedt s operation) to relieve the mechanical obstruction A similar operation (Heller s) is sometimes performed for achalasia of the cardia (in many cases a congenital condition although symptoms seldom supervene until adult life) if repeated dilatation with a bougie fails Hirschsprung s disease also demands surgery The gut at the junction of sigmoid colon and rectum (in which the neuro muscular defect responsible for the disorder lies) is excised completely and an end to end anastomosis performed

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"indigestion" What he is suffering from really is a disorder of intestinal motility It is that which is leading to his pain and discomfort, his feelings of fullness after meals, and the eructation of wind, really air swallowed, which he thinks comes from his food So he began dieting himself, cutting out meat, drinking large quantities of milk, and living mainly on cereals and other forms of carbohydrate, eating a sloppy diet because he thought he could not digest anything else Probably he has got into the habit of drinking too much with his meals, often, too, into the habit of taking stomach powders or other patent medicines, these now conspiring with his unphysiological diet to upset his intestinal apple cart" Further, behind his symptoms there is often an undercurrent of fear, the feeling that in spite of what his doctor said, he may be getting an ulcer, cancer or appendicitis

The first move in treatment is to reassure him and explain what patients never understand, namely, the fundamental difference between organic disease and functional disorders If a patient keeps getting a pain, he almost always begins to think that there must be some structural cause for it when, as a matter of fact, his symptoms are merely due to his gastro intestinal machinery not working as smoothly as it ought, largely on account of the way in which he has been treating it So it may be necessary to explain that his gut is a muscular tube and that abdominal pain can be due to functional spasm of it Then all medicine must be stopped, smoking forbidden and he must be weaned off his pathological diet and back to a normal one He will probably say that he will never be able to digest, as he puts it meat Nevertheless, he must return to it, stop drinking milk, cut down starchy food and avoid sugar, particularly eating sweets Further, he must keep his diet dry, drinking between his meals and cutting out too much tea True that a patient of this kind will probably never develop a perfect digestion Certain articles of diet may continue to upset him (these should be avoided), but, with patience and persuasion, he can usually learn to live a more normal and certainly a more comfortable dietetic life

Many a patient suffering from functional indigestion also suffers from chronic constipation and may come complaining of it Again he has almost invariably got into the habit of

treating himself and taking chemical aperients Very often he has only come because his pet" one has stopped working in spite of taking larger and larger doses So again the first move is to reassure him and convince him that he is not getting an organic stoppage of his bowels, as so often he supposes Then it is necessary to convince him, usually more difficult that his bowels not being open does not matter , that there is no law that they must be open once a day that his symptoms are due, not so much to his constipation, as to the chemical aperients which he has been taking If he stops them as he must given time, confidence and patience, his bowels will probably start to work naturally as they did when he was younger

Modification of diet helps little and it is doubtful if eating fruit, such as prunes at breakfast makes an appreciable difference It is certainly bad psychology, the patient s bowels are much more likely to work naturally if he can forget about them Nor does drinking large quantities make any difference To assist him in the re establishment of regular bowel action however he should be put on a regular physical or bulk aperient Paraffin suits some people, in others it merely passes without faecal matter sometimes soiling the clothes On the whole the bulk aperients like agar (which swell up as they imbibe water, thereby acting as peristaltic stimulants) work better Sometimes a mixture of paraffin and agar works better still and in very chronic cases the so called wetting agents, which penetrate and soften the faeces are worth trying So in most cases provided the patient can be persuaded to stop chemical aperients normal or nearly normal bowel action will be re established although he must usually continue taking agar or paraffin indefinitely But in a certain proportion of cases the doctor must admit defeat Either the patient would not co operate or his colon had become too insensitive Under these circumstances small doses of a chemical aperient are necessary given once or twice a week combined with an aperient of the bulk variety If agar is taken regularly a very small dose of senna or aloin will often empty the lower colon

In a case of faecal impaction in a child or an elderly person, or in Hirschsprung s disease (strictly speaking an organic condition) only repeated colonic irrigation combined if necessary with digital removal of faeces and the use of wetting agents,

will clear the colon (Rectal suppositories of glycerine are of some value) In ordinary chronic constipation all forms of rectal medication are strongly contra indicated

Functional diarrhoea, a relatively rare condition, is usually due to nervousness So its treatment depends on discovering and removing the cause of the patient's unrest When drugs are necessary bismuth and kaolin are of some value More useful still is agar which imbibes water and so hardens the contents of the colon Indeed, agar is a useful drug in the treatment both of chronic constipation and functional and organic diarrhoea

Functional Headache

Headache for which no organic cause can be found is a common symptom and, although the exact mechanism of its pathogenesis is little understood, the successful treatment of it depends on an accurate diagnosis of its immediate cause It may be due to constipation or rather to the consequences of taking aperients habitually Under these circumstances its treatment is clearly bound up with the treatment of, and the patient developing the right attitude to, his constipation Functional headaches may also be due to general physical unfitness, a state which medical science cannot analyse exactly yet Then it often responds to a healthier way of life, more exercise, cold baths, physical jerks, weekend walks fresh air and less food and drink Mending the patient s ways on these lines *should always be tried before resorting to analgesic drugs* On the other hand, there is no escape from the fact that functional headache is largely constitutional in the sense that some people are much more liable to headaches than others and get them much more easily when over worked, het up, in a state of mental tension, worried or out of physical health as, for example, women at their periods Analgesic drugs are therefore sometimes necessary

A not uncommon cause of functional headache is the idea of high blood pressure The patient s blood pressure may have been taken as a routine, he was told that it was raised and he has been suffering from headache ever since (Organic headache due to high blood pressure is rare in comparison to functional headache engendered by the fear of it) Or, maybe, a friend is under treatment for malignant hypertension, or a

near relative has had a stroke recently, and that put the idea into his head Under these circumstances his blood pressure must be taken and, if it is normal, he can be reassured immediately Whereupon his headaches will almost certainly fade away *When he is suffering from chronic benign hypertension* it is much more difficult, particularly if he has already been told that his blood pressure is high There is no really satisfactory treatment for it and therefore the less said about it the better, although it carries the risk of heart failure and cerebral haemorrhage But it is impossible to untell him and, if he still insists in knowing what his blood pressure is it is wise to give him the diastolic rather than the systolic figure What *must* be done is to get his attitude to blood pressure right. We all have it blood pressure is essential to life and he has the blood pressure that his body demands Further, he can be told that it is not his blood pressure which matters but the state of his arteries, and that of his is good

Anxiety States and Anxiety Neurosis

In the treatment of an anxiety state ascertaining its cause is more than half the therapeutic battle So it is essential to gain the patient s confidence and arrive at the truth For, even if he has been worrying about something which cannot be altered, his work his wife or the mess he has got into merely to talk about it to someone else will release much of the pent up emotion associated with it and give him new hope and likely as not relieve any physical symptoms of which he came complaining If he can be helped over some difficulty, the results of psychotherapy may be dramatic Further when a patient has a definite physical symptom clearly psychogenic in origin he should be asked to state candidly to what in the back of his mind he has been thinking that it must be due Again and again the same answer comes back To tell the truth I thought there must be something wrong with my heart or I thought I was getting a growth on my lungs or some answer of that kind Cardiac infarction is common in these days Nor need a person be psychoneurotic to get scared about malignant disease, particularly if some recent experience has put the fear of it into his head

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Functional diarrhoea, a relatively rare condition, is usually due to nervousness So its treatment depends on discovering and removing the cause of the patient s unrest When drugs are necessary bismuth and kaolin are of some value More useful still is agar which imbibes water and so hardens the contents of the colon Indeed, agar is a useful drug in the treatment both of chronic constipation and functional and organic diarrhoea

Functional Headache

Headache for which no organic cause can be found is a common symptom and, although the exact mechanism of its pathogenesis is little understood, the successful treatment of it depends on an accurate diagnosis of its immediate cause It may be due to constipation or rather to the consequences of taking aperients habitually Under these circumstances its treatment is clearly bound up with the treatment of, and the patient developing the right attitude to, his constipation Functional headaches may also be due to general physical unfitness, a state which medical science cannot analyse exactly yet Then it often responds to a healthier way of life, more exercise, cold baths, physical jerks, weekend walks, fresh air and less food and drink Mending the patient s ways on these lines should always be tried before resorting to analgesic drugs On the other hand, there is no escape from the fact that functional headache is largely constitutional in the sense that some people are much more liable to headaches than others and get them much more easily when over worked, het up,' in a state of mental tension, worried or out of physical health as, for example, women at their periods Analgesic drugs are therefore sometimes necessary

A not uncommon cause of functional headache is the idea of high blood pressure The patient's blood pressure may have been taken as a routine he was told that it was raised and he has been suffering from headache ever since (Organic headache due to high blood pressure is rare in comparison to functional headache engendered by the fear of it) Or, maybe, a friend is under treatment for malignant hypertension, or a

why he reacts like this, he may learn to react more sensibly This is elementary psychoanalysis, the basic principle of which is to reveal the patient to himself, and at the same time release the pent up emotion associated with those buried complexes which have been upsetting his stream of consciousness, causing his fatigue and inability to cope, and determining his psychoneurotic behaviour It assumes however that a patient will feel better when he understands himself and the cause of his symptoms Unfortunately this is not always true Further, deep psychoanalysis is seldom practical and all ordinary attempts to explain a patient's psychoneurotic traits, odd phobias obsessional behaviour, fear, restlessness agitation and physical symptoms often prove entirely unsuccessful When, however he complains of one peculiar symptom suggestion under hypnosis is sometimes tried Psychoneurotic patients are easily hypnotized and in the state of complete confidence in the doctor so engendered a symptom will often disappear completely for a time although sooner or later it returns or the patient relapses in some other way For suggestion under hypnosis is symptomatic treatment only leaving basic personality unchanged Further it is only suitable like psychoanalysis in carefully selected cases and all doctors do not possess the art of it

In most cases, as the patient s reaction to experience cannot be altered much and his powers of adaptation cannot really be increased, all that can be done is to help him over each successive difficulty and the better the doctor knows his patient and the circumstances of his life the more successful will he be in doing it He must also try to teach him how to live So often he has lapsed into bad mental habits lost the art of concentration ceased to read, think or plan Instead he spends his spare mental time worrying, his mind having become a vacuum into which fear and anxiety will flow An important part of treatment, therefore, is to get his mind occupied and active. He must be persuaded to develop an interest in something a hobby of some kind, if he will take one up, reading if he can be got to start again Manual occupations such as sewing, carpentry and gardening and organized occupational therapy all help Religion is also a great adjuvant disciplining distracting and calming the restless mind It is often possible for

he is not suffering from any organic condition and to succeed in that the doctor must be convinced himself Even then it is not always easy to convince his patient, particularly if the latter knows of some unfortunate mistake another doctor made Further, 'If I have a pain, *there must be a cause for it*," is his attitude For patients think in terms of physical causes, not understanding the difference between functional disorders and organic disease But he can usually be made to see that *all* pain is in part psychological, in that it depends on consciousness, and that the idea of heart disease or cancer of the lung can maintain pain in the chest, started by some transient trivial physical cause, long after that has ceased to act On the other hand, he must *never* be allowed to go away with the idea that the doctor thought that his pain was imaginary' No pain is ever that Further, it is well to warn him that his pain is unlikely to disappear at once The emotional build up of fear *in his mind responsible for it will take time to get unbuilt*

When a patient is suffering from a true anxiety neurosis treatment is more difficult but clearly there are two methods of therapeutic attack the one to attempt to alter the circumstances of his life, the other to strive to alter his reactions to experience, in fact to alter him

Sometimes the circumstances of his life can easily be altered For example, psychoneurotic behaviour in the difficult child may be due to the way in which his parents are handling him, psychoneurotic breakdown in an adolescent to psychological misfit at school or work, in a man in war time to the conditions under which he is now compelled to live, in a woman in her home to the problem often created by her in laws" For many potentially psychoneurotic people get along perfectly well when life is pleasant and only break down when circumstances turn against them and the strain imposed upon their powers of adaptation to its problems becomes too great So, if the patient s circumstances can be altered, symptomatically at least and for the time being he may get well again

More often they cannot be altered Then an effort must be made to alter his reactions to them This can sometimes be done by helping him to understand himself better and to do that it may be necessary to go back over his life and find out what happened then, to explain his reactions now If he sees

ordinary civil life) Similarly when a young woman unhappy at home develops anorexia nervosa, she should be sent to a new environment, and a child who develops hysterical symptoms often recovers dramatically if it can be removed from the influence of its parents, against whom it is reacting and sent to a boarding school But most hysterical reactions are unjustified and must in the interest of society be nipped in the bud A man must not be allowed to use pain to get compensation for an imaginary injury for example, or a woman her heart attacks, to keep a daughter at home, or her rheumatism, in order to make repeated visits to hospital and so appear a martyr to herself and in the eyes of other people Under these circum stances the doctor s duty is to protect the patient s relatives and friends and society as embodied in the State

Therefore an attempt must usually be made to alter the patient s reactions which usually means trying to alter his basic attitude to life Psychoanalysis seldom accomplishes anything It demands the active and intelligent co operation of the patient and hysterics are usually uncooperative people and of poor quality mental stuff the hysterical diathesis shading off, as already explained, into psychopathic personality But an attempt can be made to explain the mechanism of his symptoms to him without appearing censorious, and then persuade him to adopt a less selfish and more moral attitude to life On the other hand, it is most unwise to proceed too fast and reveal the patient to himself too quickly That may lead to a violent reaction on his part against his doctor who loses his patient immediately It is also necessary to proceed slowly in explaining the position to the patient s near relatives whose active co operation is essential in his management For laymen find hysteria difficult to understand They cannot see the difference between it and malingering and often it is quite inconceivable to them that the patient (husband wife mother or father) could possibly behave like that But if the doctor does not take his *patient s symptoms too seriously steadily refusing* to admit any organic cause for them and consistently refuses the treatment that the patient wants, it often begins to dawn on his subconscious mind that the game is up and then his symptoms may remit But in most cases all attempts on these lines fail In fact chronic hysteria is often an incurable disease

the doctor to "cash in" on his patient's belief Indeed, it is in this way that faith healing so often works Give the patient faith, and fear and anxiety remit * On the whole drugs should be avoided, certainly in patients who complain of gastro intestinal symptoms In others sedatives in moderation may be necessary to secure sleep and, *if a patient is very restless* and agitated, and psychotherapy fails to calm him down, a period of continuous 'narcosis" under one of the stronger barbiturates should be tried Tonics should seldom be given to the patient psychologically tired In the first place, they do not really exist In the second, he must learn to rely on himself, not on some medicine which his doctor gives him Nevertheless, patients still believe in tonics So, prescribed with suggestion, they are sometimes effective and on occasions it is right to use them The time honoured alkaline gentian mixture is cheap Further, it is gastric sedative and sometimes improves appetite

Hysterical Reactions

The hysterical patient is even more difficult to treat than the neurotic The latter *would be well and fit* The former *wants to keep his symptoms* as long as they are necessary for achieving his subconscious purpose So he makes a show of wanting to be better, but, until he has got what he wants or his symptoms have ceased to serve a purpose, has no intention of getting well He is fighting, not with, but against, his doctor Nevertheless, the same principles of treatment apply If possible, the circum stances which render his hysterical symptoms necessary should be altered If that cannot be done, an attempt must be made to alter his reactions and persuade him to adopt a different attitude to life

Occasionally it is both justifiable and possible to alter his circumstances For example, when a man under the strain of active service develops paralysis or fits, it is asking too much to keep him in the fighting line (A man who develops hysterical symptoms under the strain of war can often stand up to that of

* Whether faith can so alter the state of mind of a patient as to put *organic* disease into reverse is another question In view of the fact that certain mental states predispose to organic disease of certain types it is not impossible. Whether the faith of one person can cure organic disease in another *without* the mental co-operation of that person is a third and distinct question The answer depends entirely on whether the reader believes that man is ever empowered to alter the usual course of natural events i e perform miracles

fomentations (now rather out of date), hot kaolin hot water bottles, hot wax, or by radiation in the form of electric light bulbs or an infra red lamp, the rays of which penetrate the tissues more deeply

Pain can also be relieved by infiltrating a painful area with a local anaesthetic which acts on sensory nerve endings Its effect wears off in a few hours however More permanent relief can be effected by injecting the appropriate sensory nerve with alcohol as in the treatment of trigeminal neuralgia The nerve fibres below the point of injection degenerate, but are gradually replaced by downward growth of new fibres from above, and after a few months sensation may return and with it, unless the pathological process has remitted in the meantime the original pain Permanent anaesthesia in the lower limbs can, however, be secured by injecting the spinal cord, where regeneration never occurs, but of necessity only at the expense of complete paralysis of the legs, loss of voluntary control over the bladder and a considerable risk of bed sores Certain operations are also permanent in their consequences and, if chosen rightly more appropriately selective the two operations most commonly performed are posterior rhizotomy, i e the division of selected posterior roots leaving the corresponding anterior ones intact, and chordotomy i e the division of the spino thalamic tract on one side without it is hoped touching the fibres of the pyramidal tract The operation of leucotomy is now also sometimes performed for chronic pain Although it does not abolish pain, it affects consciousness in some mysterious way so that pain no longer seems to matter It is not without risk however Damage to motor tracts may be done and it may lead to some deterioration in personality

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1 Acetylsalicylic acid sodium salicylate phenacetin and amidopyrine
2 The morphine substitutes, namely pethidine, amidone and methadone

and imposes a heavy financial burden on the State in the form of unjustified compensation claims, sick benefit and hospital treatment which these patients so often succeed in getting

COMMON SYMPTOMS IN DISEASE

Certain symptoms are the common property of disease of many kinds irrespective of the part of the body affected, and, in organic disease, frequently demand active treatment The three most important are pain, pruritus and insomnia

Pain

The right way in which to treat pain of organic origin, i e that due to over stimulation of peripheral nerve endings or spinal nerve roots (pain of central origin is rare), is to remove its cause But this may take time and sometimes prove impossible *So it must often be treated symptomatically Sometimes the* circumstances which bring it on can be avoided Sometimes the conductivity of a peripheral nerve can be reduced and some times the pain receptors in the thalamus and sensory cortex must be depressed In general the simplest method should be tried first but in practice a combination of methods often works best Further, all pain depends on consciousness and can, therefore, often be reduced by the maintenance of self discipline or the removal of apprehension and sometimes even abolished under hypnosis

Pain can often also be largely prevented if the mechanism of its pathogenesis is understood, for example colonic pain, by stopping chemical aperients, angina of effort, by avoiding too *much exertion, angina cruris, by not walking too fast,* pleural pain, by strapping the chest, that of a peptic ulcer, by taking alkaline powders, that of vascular congestion, by the application of cold, that of raised intracranial pressure by ventricular puncture that of a fracture, by immobilization in splints or plaster Further, for reasons not altogether clear, *most pain,* that of vascular congestion and an exposed nerve excepted, can be reduced by the local application of heat This is particularly true of pain of the rheumatic kind, so often associated with *muscular stiffness, and heat for this purpose can be applied in* a number of ways by direct application in the form of hot

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2 The morphine substitutes, namely pethidine amidone and methadone

3 The opium derivatives, namely, codeine, morphine and diamorphine (heroin)
4 Chlorpromazine and the other 'tranquillizers'

When severe pain is due to some cause which can be quickly remedied, a fracture or an acutely inflamed appendix, for example, the strongest analgesics, including the drugs of addiction, can be given with safety. The patient has too little time in which to get addicted before the fracture is splinted or the appendix removed. When it is due to some incurable but non-lethal condition, for example, chronic arthritis or neuritis, or to trigeminal neuralgia, which has failed to respond to injection of alcohol, the therapeutic situation is very different. Drugs which do not lead to habit formation must be tried first. Some patients, it will be found, stand phenacetin better than acetyl-salicylic acid (aspirin) and both are often better tolerated if given in conjunction with caffeine. If these prove insufficient, codeine should be added to an analgesic powder made up of the other two. Although an opium derivative and a good analgesic, it never leads to addiction. If the pain still persists, the synthetic morphine substitutes, amidone, pethidine or methadone can be legitimately tried. Nevertheless, the doctor should be sceptical of pain which does not respond to analgesics, and particularly of trigeminal pain, which still persists after repeated injection of the nerve. There may be a greater psychoneurotic element in its pathogenesis than was at first supposed and, although there are no *absolute* rules in the conduct of medical practice, it is probably wise *never* to give the real opium alkaloids, other than codeine, in the treatment of trigeminal neuralgia.

When, on the other hand, severe pain is due to some *progressive* pathological process for which there is no radical cure, the opium alkaloids can and should be given without any hesitation. There are, however, two provisos. If the patient's pain is due to local carcinoma of bone, palliative deep X-ray treatment should be tried first. If it is due to a growth elsewhere, rhizotomy or chordotomy should be considered before drugs are started. For increasing doses will be required, as the patient develops tolerance, and the doctor must be prepared to go on doubling them. Heroin is often tolerated better than

morphine and, as it is less soporific, is often the alkaloid of choice

In attempting to pursue this policy however, the doctor may run into a serious difficulty A considerable proportion of patients (probably about a third), are intolerant of the opium alkaloids in the sense that in them they lead to nausea, vomiting and misery Under these circumstances there are now four alternative 'ways out' The first thing to try is a combination of morphine with bemegride or nalorphine These drugs antagonize its unpleasant side effects without affecting its thalamic action Another possibility is to rely on the morphine substitutes not really very efficient as pain relievers Thirdly the patient will sometimes sleep out his days comfortably on one of the stronger barbiturates (Hexobarbitone given four hourly by the mouth is often most effective) The fourth alternative is to resort to one of the modern tranquillizers (of which chlorpromazine is the most effective), drugs which although they do not abolish pain, alter the patient s reactions to it. Nevertheless their action like that of all drugs is far from consistent They work in some cases and not in others, and in general a combination of as much opium alkaloid as a patient can tolerate, chlorpromazine and a fairly strong barbiturate is often the best policy in the face of lethal pain But the relief of it is a high art and one which though much can be written about it, is really only learnt by experience

Pruritus

The right way in which to treat pruritus (irritation) is the same as that in which to treat pain namely to remove the stimulus causing it and this in the case of pruritus is usually pathological stimulation of sensory nerve endings in the skin But again this may take time, as in the treatment of a chronic skin condition, or may be impossible, as, for instance in the case of pruritus due to a high concentration of bile salts in the blood in obstructive jaundice Under these circumstances pruritus demands symptomatic treatment and the patient s co operation must be sought He must stop scratching which although it may bring him temporary relief always leads to further irritation, a vicious circle becoming rapidly established (In children it may be necessary to protect an itching area with

plaster or to bind the hands) Local applications to reduce the sensitivity of the skin should be tried, first, cold in the form of evaporating lotions, or calamine, a remarkable skin sedative, or hydrocortisone or anti histamine ointments, depending on the nature of the case If these fail, the sensitivity of the peripheral nerve endings can be reduced by the application of benzocaine ointment or more permanently by means of a small dose of X rays (This latter method is particularly useful in the treatment of senile pruritus for which no local cause other than age change can be found in the skin) But it is also often necessary to damp down the receptor centres in the thalamus The best drug for this purpose is phenobarbitone which can be given in moderate doses over long periods with perfect safety

Insomnia

Sleeplessness may be secondary to some other symptom such as pain or cough, or due to colonic disorder, fever, anxiety, worry, mania or endogenous depression Under these circumstances treatment will be directed to removing its primary cause But again this may take time and in the meanwhile drugs may be necessary to secure rest

In a case of mania a subcutaneous injection of morphine and hyoscine or an intramuscular injection of a barbiturate may be necessary to get the patient under control After that paraldehyde, which can be given by the mouth, *per rectum* or by intramuscular or even intravenous injection, is much the safest hypnotic on which to keep him quiet It is also the drug of choice in the delirium of fever, and in pneumonia, meningitis, encephalitis and tetanus It does not depress the respiratory centre, the dose is easy to gauge and there is little risk of starting addiction

The treatment of primary insomnia is a different problem In elderly people it is a question of restoring and maintaining the declining sleep habit of the body Minor remedies, such as a quiet room, a softer pillow a drink before going to bed, having failed, it will be necessary to resort to drugs Here the barbiturates have replaced chloral and its derivatives (A combination of chloral and bromide is still the best hypnotic in a teething child) The first question will be which one If the patient cannot get off to sleep, a quick acting one, such as

amylobarbitone or pentobarbitone, will be chosen If he goes to sleep but wakes up and cannot get to sleep again a long acting one, such as barbitone or phenobarbitone, is indicated Sometimes a combination of the two serves best, but it is never possible to predict which barbiturate or what combination will suit a patient and it may be necessary to try first one and then another Further it is usually a mistake to give him a box of tablets and tell him to take one or two as required (Self treatment should always be avoided) Rather he should take the same dose every night until he is sleeping well Then perhaps a reduction of dose can be considered But the patient is always afraid of that (going to sleep demands confidence) and it is really better although it creates more dispensing trouble to prescribe barbiturates as their sodium salts in solution in highly coloured, strongly flavoured mixtures Then the dose can be reduced when he starts sleeping well, without him knowing anything about it

DISORDERS OF FUNCTION COMMON TO MANY ORGANIC DISEASES

A number of disorders of function leading to symptoms and signs of a certain kind are inevitable wherever any pathological process affects a particular part of the body to a sufficient extent Then immediate therapeutic action is sometimes demanded, if life is to be saved Action of some kind is also often required to maintain functional order pending its exact diagnosis and radical treatment When a patient is suffering from an incurable disease the disorder of function responsible for his symptoms must be treated as long as he remains alive

Respiratory Failure

When breathing stops suddenly, owing to failure of the respiratory centre in the medulla artificial respiration must be started immediately In the operating theatre an endo tracheal tube is passed at once and rhythmic pressure applied to the anaesthetic bag in order to inflate the lungs Under other circumstances for example, in the case of a man just rescued from drowning or found unconscious suffering from carbon monoxide poisoning artificial respiration should be started by

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the modern modification of Schafer s original method He is placed on his face with his head hanging slightly down to allow water to drain out of his lungs Then having made sure that his tongue is well forward, to keep his air way clear, the operator kneels across his body and alternately presses the sides of his chest to effect expiration and then lifts his shoulders up and pulls back his upper arms to effect inspiration As soon as it can be obtained, a closed inhaler connected to a cylinder of five per cent carbon dioxide in oxygen is held over his face and repeated injections of nikethamide given intramuscularly

When respiratory failure is due to some subacute or chronic pathological process affecting the lower motor neurones to the muscles concerned with breathing, some form of mechanical artificial respiration must be adopted In a case of poliomyelitis limited to the cord, i e in the absence of bulbar palsy, the use of a Drinker apparatus (the iron lung of the popular press) should be considered first This involves no surgical operation and the air entering the lungs has been moistened warmed and filtered by passing through the nasopharynx On the other hand, it is an alarming machine and the incompletely paralysed patient tends to resist its action (which is to effect inspiration by reducing the pressure outside the chest) at first Further, he is compelled to lie flat increasing the risk of bronchopneumonic infection always great in respiratory paralysis, although it can be reduced by covering" his lungs with antibiotic drugs Bulbar palsy is an absolute contra indication to the use of Drinker's machine however If the patient is unable to swallow, coughing in it being difficult, secretion from his naso-pharynx is bound to flood his lungs

For this and other reasons the use of Drinker s machine even in the management of respiratory failure in poliomyelitis is now yielding ground to the alternative short term method of handling the situation, namely tracheostomy and positive inflation of the lungs through an endotracheal tube This *method has the advantage of being less frightening* and the patient can be moved about in bed which reduces the risk of bronchopneumonia and bed sores True that the protective function of the naso pharynx has been by passed but again the lungs can be covered ' with antibiotics and the air inspired filtered and kept warm and moist artificially This method is

certainly the best in post diphtheric paralysis and peripheral neuritis, in both of which conditions bulbar palsy is not infrequent and may develop suddenly The trouble is that tracheostomy cannot be maintained indefinitely Nor does it allow the patient much personal mobility The answer to the problem of permanent partial respiratory paralysis, such as occurs in lower motor neurone disease and is sometimes left behind after poliomyelitis is the Bragg Paul pulsator This effects expiration by applying pressure rhythmically round the lower part of the chest leaving inspiration to passive recoil True that in its action it is less physiological than Drinker s machine but it is much simpler and has granted many patients with permanent partial respiratory paralysis years of reasonably comfortable life

Far more often respiratory failure is due not to any disorder of the reflex mechanism of breathing but to reduction of the volume of air which can be got in and out of the lungs by the muscles of respiration in the time available during the respiratory cycle on account of mechanical obstruction of the respiratory tract When this is at laryngeal level there are two possible courses of action, intubation and tracheostomy That chosen will depend on the nature of the pathological process causing it In laryngeal diphtheria the former is usually regarded as the procedure of choice although expert assistance must always be at hand in case the child coughs out the tube In primary new growth of the cords and paralysis of the vocal cords tracheostomy is necessary Tracheal obstruction below the level of the neck such as is produced by primary carcinoma in the region of the carina or the pressure of enlarged mediastinal glands can only be relieved by a direct attack on the pathological process responsible for it When that is impossible respiratory distress must be relieved by giving morphine in large doses

A much more common cause of respiratory failure in this sense is bronchial spasm and/or congestion and oedema of the bronchial mucosa, an almost invariable concomitant of bronchial infection and the cause of bronchial asthma of all kinds In an acute attack of the latter respiratory distress calls for immediate relief A subcutaneous injection of adrenaline which dilates bronchial muscle and reduces bronchial congestion by stimulating the sympathetic nerve endings in the

bronchi, should be tried first (Atropine will also relieve bronchial spasm by paralysing the nerve endings of the para sympathetic system, but may increase obstruction by drying up secretion and rendering it more difficult to expectorate, besides causing unwanted side effects) A longer lasting although less powerful effect can be obtained by an intramuscular or intravenous injection of aminophylline Sedation is also always important Indeed, half the therapeutic battle is to get the patient sleeping and adrenaline should be backed up by a full dose of one of the stronger barbiturates by the mouth or by intramuscular injection If this combination fails, pethidine should be considered first It is a peripheral antispasmodic, the risk of addiction to it small and its sedative action con siderable The use of morphine is rarely justified It is not an antispasmodic and the addiction risk is great (Many morphine addicts are sufferers from asthma) Wiser, when pethidine fails, to tackle the problem of the immediate relief of symptoms, not by giving sedatives, but by steroid therapy For cortisone (which can be injected intravenously) blocks the *reaction between antigen and antibody, the immediate cause of* the allergic attack In status asthmaticus treatment on these lines alone may prove successful

In order to prevent recurrent attacks, and in cases of chronic broncho spasm with subacute exacerbation, drugs which dilate the bronchi and which can be given over long periods should again be tried first Adrenaline cannot be given by mouth but the inhalation of a solution of it is often helpful, particularly to dilate the bronchi on first waking in the morning Isopren aline, chemically closely related to it, is rapidly absorbed from the mucous membrane of the mouth (A tablet should be allowed to dissolve under the tongue) Ephedrine which is also chemically related to adrenaline, but escapes destruction in the stomach and so can be given by mouth, is unfortunately much less effective as a bronchial dilator Nevertheless, *it is useful in chronic cases So too is* aminophylline given by mouth, and it is always worth while backing up these stronger bronchial dilators by putting the patient on the time honoured mixture of potassium iodide, to loosen his sputum, lobelia and stramonium Further, the purely symptomatic *treatment of* the patient must be combined with encouragement, reassurance

and the removal of sources of emotional unrest which often precipitate his attacks But it is impossible to alter his psychosomatic constitution Nevertheless it may be possible to protect him from the attacks to which he is by nature predisposed by permanently raising the cortisone content of his blood On the whole it is wiser to inject A C T H than to give cortisone, although in practice a combination of the two sometimes works best Steroid therapy should, however, always be started with hesitation in view of the attendant risks (page 353) in asthma that of infection particularly It demands careful supervision but it is sometimes the only way of enabling a chronic asthmatic to lead a reasonable life

Other causes, and there are many of interference with the efficiency of the lungs as organs of external respiration must be handled according to their nature in so far as that permits Obstruction of a bronchus can sometimes be relieved a collection of fluid in a pleural cavity usually removed and the lung kept inflated in pneumothorax by inserting a canula through the chest wall and applying intermittent or continuous negative pressure When a lung or part of one is consolidated by some infective process the patient s immediate respiratory symptoms and his central cyanosis can sometimes be relieved by raising the partial pressure of oxygen in his alveoli This can be effected by one of two methods making him breathe oxygen through a closed inhaler or putting him in an oxygen tent. The former demands co-operation on his part So in the case of a sick child or a very ill man, a tent is the only satisfactory one Nevertheless contrary to what might have been expected some patients with respiratory distress due to pulmonary disease cannot tolerate oxygen Indeed it may kill them probably due to the fact that as it relieves their anoxia, their respiration becomes too shallow to eliminate their carbon dioxide with the result that they lapse into coma due to retention of it So the decision as to whether to put a patient in an oxygen tent or not may be difficult and if he has been put in one and in spite of regaining his colour his level of consciousness now declines he must be taken out of it at once It is therefore often wise to try the effect of oxygen through a closed inhaler before embarking on the more cumbersome procedure of a tent

The treatment of chronic emphysema is unsatisfactory Not

only is the vital capacity of the lungs reduced, but the time required to get air out of them is much increased and the circulation of the blood through them is often embarrassed Breathing exercises help little and the sheet anchor in the management of emphysema is treatment of secondary bronchial infection and its attendant handicap of broncho spasm

Another important cause of reduction of the effective vital capacity of the lungs is congestion of them due to acute and chronic left heart failure Under these circumstances treatment must be primarily directed to the heart

Heart Failure

Acute heart failure, sudden failure of cardiac output on which both systemic and pulmonary blood pressure depend, demands a quick assessment of its cause

In cardiac infarction pain usually dominates the clinical scene and, though the systemic blood pressure may fall owing to reduction of cardiac output, it is often maintained or even raised above its normal level by compensatory vaso constriction The patient should be nursed sitting up, unless his blood pressure is very low, and his pain relieved with morphine Anti coagulants (e g heparin followed by phenindione) are sometimes given with the idea of preventing any extension of arterial thrombosis, mural thrombosis in the ventricle and venous thrombosis in the legs of which there is always a risk when an elderly person is confined to bed Against their use must be set the slight risk of haemorrhage into the myocardium (and possibly elsewhere) and the fact that they can seldom be continued indefinitely They must usually be faded out eventually and then thrombosis may recur Further, they can only be used in hospital, or when laboratory facilities are easily available as the dose of phenindione must be carefully regulated and this demands frequent estimations of the prothrombin time For, on the one hand, the coagulability of the blood must not be reduced too much, creating the risk of haemorrhage, on the other, it must clearly be reduced enough Some maintain that anti coagulants should be given in all cases, that taking the risk of *not* giving them is *never* justifiable This extreme view is hardly practicable Rather, each case must be considered individually They should certainly be given to any relatively

young patient without much evidence of arteriosclerosis who has had a large infarct and in whom thrombosis may have been due to a transient tendency to an increase in blood coagulability But common sense questions the worth whileness, in view of the slight overall reduction of mortality claimed (mainly theoretical), of giving them in slight cases in the very arterio sclerotic in the very hypertensive and in the very old

If sudden failure of cardiac output is due to the heart suddenly starting to beat too slowly or stopping momentarily abrupt loss of consciousness or fainting rather than pain or dyspnoea constitutes the main presenting symptom The con ductivity of the AV bundle has suddenly failed and an injection of adrenaline should be given immediately, backed up by ephedrine by mouth, to restore it In some cases atropine which acts by blocking the parasympathetics instead of stimulating the sympathetic nerve endings, works better Under certain circumstances for example, if the underlying patho logical process is believed to be inflammatory the use of cortisone, which inhibits inflammatory reactions, or one of the drugs allied to it, should be considered (page 353) If, on the other hand failure of cardiac output is due to the heart suddenly starting to beat too fast steps must be taken to reduce its rate When its rhythm is regular, the patient is suffering from some variety of paroxysmal tachycardia in which case the attack can sometimes be aborted by direct pressure on the baroceptors in the carotid sinus or by reflex stimulation of it by pressure on the eyeballs Even repeated swallowing or holding the breath may stop it When these methods fail quinidine in the largest doses that the patient can tolerate by reducing the irritability of the heart muscle and prolonging its refractory period may help to arrest an attack and after that its regular administration in smaller doses prevents the recurrence of further ones

When the rhythm of the heart is completely irregular then tachycardia is due to auricular fibrillation and under these circumstances digitalis should be given immediately in order to block the AV bundle sufficiently to control the ventricular rate In an urgent case digoxin should be given intravenously backed up by digoxin or digitalis by mouth The best results will be obtained in the rheumatic cases Thyrotoxic

auricular fibrillation never reacts well to digitalis Later, when signs of congestive failure have disappeared, attempting to restore normal rhythm with quinidine can be considered, but in rheumatic cases, except those of recent onset and with minimal symptoms of failure, it is seldom worth while for a number of reasons It is only a temporary measure, all cases relapse sooner or later Secondly, the benefit of it is not great, heart failure in auricular fibrillation is not due to the ventricular irregularity but to the ventricular tachycardia and this can be easily controlled with digitalis Thirdly, the procedure is not without risk some people are sensitive to quinidine and, if clots are present in the auricles, the sudden restoration of sinus rhythm may eject one as an embolus So it is wiser in most cases to let the fibrillation of the auricles continue and control the rate of the ventricles with digitalis In thyrotoxic auricular fibrillation and the occasional case due to cardiac infarction, however, there is no valvular lesion and no embolic risk Further, in the former, the cause can be removed, although quinidine will rarely restore normal rhythm until the patient with active thyrotoxicosis has had a thyroidectomy or has begun to respond to treatment by radioactive iodine

In acute heart failure due to sudden peripheral vaso constriction, necessitating rise of systemic blood pressure to maintain the circulation, theoretically the patient should be put on hypotensive drugs which can be given by injection or by the mouth In point of fact they may make him worse rather than better because the reduction in load effected by calling off vaso spasm is more than offset by reduction of the coronary blood supply to the myocardium as the diastolic pressure falls So it is often wiser, as in all cases of acute left heart failure due to other causes (namely aortic coronary and myocardial disease) to relieve his subjective respiratory distress with morphine, give him an immediate injection of digoxin to help his myocardium and mersalyl or chlorothiazide to diminish the oedema which has reduced the vital capacity of his lungs Another drug well worth using is aminophylline Not only is it a diuretic, but it dilates the coronary arteries Further, it is also an anti spasmodic and relieves the secondary bronchial spasm which is such a common concomitant of left heart failure

Far more often cardiac failure is relatively chronic and under these circumstances venous congestion, rather than failure of cardiac output with low blood pressure, dominates the clinical scene In mitral stenosis with relatively little incompetence the operation of valvotomy should be considered as soon as dyspnoea on exertion begins to limit the patient s capacity to live a normal life, and must be done if it is ever to be done before he is too old, before clots have started to form in his auricles and before auricular fibrillation supervenes When his symptoms are due to mitral incompetence rather than stenosis valvotomy can serve no useful purpose but pure aortic stenosis and pure tricuspid stenosi can also be relieved successfully by surgery

In most cases of chronic congestive cardiac failure nothing radical of this kind can be done to reduce the handicap which disease has imposed on the heart Auricular fibrillation has come to stay, the valvular lesion cannot be altered and there is no treatment either for rheumatic ischaemic or degenerative myocardial change The management of congestive failure is therefore always much the same irrespective of its cause The patient s work must be limited to that which his disability permits He must always stop short of cardiac pain or serious dyspnoea A restricted diet may be necessary to stop him gaining weight Graded exercises should sometimes be prescribed particularly in cases of coronary disease to encourage the development of an anastomotic circulation in the heart itself Digitalis helps most patients, particularly those with auricular fibrillation by keeping the ventricles beating at the optimum rate Absence of auricular systoles matters very little

When on account of left heart failure he begins to develop oedema of his lungs, injections of mersalyl should be given and once left heart failure has become transmitted to the right side, and in primary right heart failure due to mitral stenosis or chronic lung disease in which oedema rather than breathlessness is the main symptom diuretics are necessary as a routine Mersalyl should not be given more than twice a week and seldom more than once a week over a long period on account of the risk of mercurial poisoning It works best if the pH of the blood is shifted in the acid direction by the prior administration of ammonium chloride and only works if given intramuscularly Largely for this reason, and on account

of the patient's objection to pricks, a new diuretic chlorothiazide is gaining popularity, being as efficient given by mouth as mersalyl given by intramuscular injection The only objection to it is that it tends to deplete the body of potassium but that can easily be remedied by giving potassium chloride When diuretics start to fail, mechanical methods of getting rid of oedema must be considered First the patient should be nursed in a cardiac bed or sitting in a chair so as to allow fluid to drain into his legs Multiple small incisions should then be made into them or Southey's tubes inserted under his skin, the patient being 'covered' against infection with antibiotic drugs In some cases paracentesis of the abdomen is necessary to get rid of ascites and make him more comfortable, or of the chest to get rid of pleural exudate and relieve dyspnoea

Cough

A dry cough serves no useful purpose Rather, it does harm, keeping the patient awake and, in a hospital ward, often other patients as well Very often it is due to a hypersensitive state of the back of the pharynx in which case simple remedies may suffice to relieve it, sips of water and sucking lozenges When these fail, or a dry cough is tracheal, bronchial or pleural in origin, the reflex through the medulla must be damped down by the administration of a cough sedative Codeine and morphine are the most efficient A small dose of one or other in a small quantity of demulcent vehicle, a cough linctus, is usually given

In the meanwhile steps should be taken to stimulate bronchial secretion For most coughs sufficiently severe to demand medical treatment mean that the patient is suffering from tracheitis or bronchitis, and as soon as a dry cough becomes productive it is much less distressing The air which he breathes should be kept warm and moist by means of steam from the time-honoured bronchitis kettle In infection of the upper respiratory tract expectorants are of little value but hot inhalations of Tinct Benzoin Co are often useful, particularly in cases of sinusitis When infection is lower down expectorants are usually given, of which two have a reputation for increasing bronchial secretion, potassium iodide, excreted through all mucous membranes including that of the bronchi, and

ipecacuanha which stimulates bronchial secretion reflexively from the stomach The former probably helps to start bronchial secretion and seems to loosen sticky sputum which the patient *has difficulty in coughing up Small doses suffice* (The administration of iodides as an expectorant will invalidate the result of any radioactive iodine uptake test in a case of suspected thyrotoxicosis for several weeks after they have been stopped) Another method of loosening sticky sputum is to get the patient to inhale one of the wetting agents, converted into a fine mist in a nebulizer, which penetrate it and render it less viscid and easier to cough up

Once bronchial secretion has set in, coughing must be encouraged during the day to keep the bronchi clear, although it may still be necessary to give a cough sedative at night to procure sleep Ammonium carbonate is said to sensitize the cough reflex and increase coughing and is a constituent of many cough mixtures But it is doubtful if it really accomplishes much, and in any serious case of bronchial infection it is much more important especially in an open lung abscess or bronchiectasis, and *when the patient is too weak or ill to cough his sputum up* to start postural drainage This is particularly necessary in the early morning to clear tubes and cavities of secretion that has accumulated during the night but to drain efficiently the particular lobe or segment of the lung affected must be known To find this out a bronchogram is often necessary

Vomiting

Vomiting is a protective reflex but, like so many others, one which can easily be overdone Further in certain pathological conditions notably cerebral vomiting and sea sickness, it seems to serve no useful purpose So whenever possible, it should be stopped by removing, damping down or antagonizing its cause

Cerebral vomiting can be controlled up to a certain point by *giving drugs which inhibit the vomiting centre in the* medulla The best for this purpose is morphine which it must be remembered, also inhibits the respiratory centre When however cerebral vomiting is due to rise of intracranial pressure steps must be taken to reduce the pressure inside the skull Lumbar puncture is the obvious method of doing it but is dangerous if done too quickly as it may lead to fatal prolapse of

the medulla through the foramen magnum It is much safer to make burr holes in the skull and decompress the cerebral hemispheres or actually aspirate the ventricles, a procedure often of simultaneous diagnostic value The secretion of C S F can also be temporarily reduced, and the intracranial pressure reduced, by giving hypertonic magnesium sulphate *per rectum* or running hypertonic saline into the blood In a chronic case it may be necessary to trephine the skull to effect permanent relief of intracranial pressure

Sea sickness, vomiting of labrynthine origin, can often be prevented by the prior administration of drugs Those which often prove effective include hyoscine, a central nervous system depressant, and many of the anti histamine group The nausea and vomiting caused by giving morphine to certain people can sometimes be prevented by the simultaneous administration of bemegride or nalorphine and that so common after deep X ray therapy by giving pyridoxin and sometimes again by means of one of the anti histamines

When vomiting is due to mechanical obstruction of the gastro intestinal tract, the stomach must be kept empty pending surgical intervention When it is due to gastric irritation, as in chronic uraemia, the best treatment may be to keep washing it out When it is due to irritability, as in ulcer and gastritis, over stimulation of it should be avoided and gastric sedatives given These include those that act by reducing gastric acidity and also the so called carminatives, notably alcohol, gentian, capsicum and bitters, which are valuable in the control of hiccough This odd symptom, like vomiting, may be central, gastric or reflex, and sometimes exceedingly difficult to control In central hiccough strong sedative drugs may be required

Diarrhoea

The treatment of diarrhoea also depends basically on the removal of its cause but it is sometimes possible to stop or reduce it short of that Drugs which tend to lessen the sensitivity of the colon and inhibit diarrhoea include the astringents, which are not of any great value, bismuth and kaolin which are useful, opium which is much more effective, and agar which acts by imbibing water Persistent vomiting and diarrhoea both lead to dehydration and loss of electrolytes This state must always

be anticipated and prevented (page 399) pending removal of its cause

Constipation

Chronic constipation is usually a functional condition and the management of it, often difficult has already been dis cussed Chronic organic constipation often presents not with simple cessation of bowel action but with apparent diarrhoea due to accumulation of secretion above the point of obstruction The treatment of it, and therefore of apparent diarrhoea is of necessity surgical The obstruction must be removed if possible When this proves impossible colostomy is necessary as a tem porary, and if the cause of the obstruction cannot be removed, sometimes justifiable as a permanent measure

Acute obstruction of the gut with strangulation of the vessels supplying it demands immediate surgical action When the bowels stop working as the result of paralytic ileus (usually after an abdominal operation) the gut should be kept empty by suction drainage pending spontaneous recovery of gastro intestinal muscular activity Drugs which stimulate the para sympathetic nerve endings in the colon notably neostigmine are of some value in this condition and also in the acquired megacolon of the very constipated person The treatment of Hirschsprung s disease a congenital organic condition is discussed elsewhere (page 305)

Renal Failure

Failure of the kidneys to secrete urine, anuria demands the immediate treatment of its cause Very occasionally it is the result of simultaneous obstruction of both ureters usually by bilateral calculi Under these circumstances if ureteric catheters cannot be passed successfully bilateral nephrostomy is essential pending the relief of the obstructions somehow Far more often anuria is due to dehydration resulting from diarrhoea or vomiting the treatment of which will be discussed later (page 400) or to mechanical obstruction of the urethra, the treatment of which will be discussed below When it is due to acute renal disease, from which the patient may recover, as in acute nephritis the crush syndrome after the transfusion of incompatible blood and following mercurial poisoning, he

must be treated so that the accumulation of katabolites and water in his body is reduced to a minimum This means keeping him at complete physical rest and supplying his basal metabolic requirement by giving him 100 G of fat emulsified in a litre of 25 per cent glucose in water through a stomach tube If for any reason it cannot be given by this route, then 45 per cent glucose should be given intravenously but, as this will thrombose most superficial veins, it must usually be given by means of a catheter passed into the superior or inferior vena cava so that it is immediately well diluted Small doses of insulin, which promote the rapid formation of glycogen which tends to use up any excess potassium, one of the most dangerous katabolic products, should also be given The use of the artificial kidney in cases of anuria is still in the experimental stage

In progressive failure of renal function leading to rise in the concentration of urea in the blood, the intake of protein should be cut down and that of carbohydrate increased, to prevent endogenous protein katabolism, and the intake of fluid raised to the maximum which the kidneys can handle But glomerular filtration is also always impaired and, if fluid is pushed too hard oedema is inevitable So all that can be expected is transient amelioration of the patient s symptoms Indeed, there is no really worth while treatment for the progressive uraemia of chronic nephritis

When renal failure takes the form, not of urea retention but of loss of plasma albumin, attempts have been made to keep up the concentration of albumin in the patient s blood by transfusing him with concentrated plasma But they are seldom of any avail The albumin given is rapidly lost in the patient's urine All that can really be done is to keep him on a high protein diet and treat his oedema symptomatically in the same way as in the treatment of congestive cardiac failure

Retention of Urine

Retention of urine in the bladder is often precipitated in an elderly man with some slight degree of organic obstruction when he must be put to bed for any reason and so is not uncommon after any operation An injection of morphine and a warm bath will often relax the sphincter Alternatively, the parasympathetic nerve endings in his bladder which relax its sphincter and cause

the muscles in its wall to contract, can be stimulated by an injection of carbachol When these methods fail there is nothing for it but to try to pass a catheter and if this attempt proves successful, his urine should be let out slowly, to obviate the risk of reflex anuria Another problem now arises Should the catheter be left in or should he be catheterized thrice daily? The answer to this question depends on the ease with which it passed, the probable nature of the pathological process responsible for his condition and the policy likely to be adopted in relation to it in view of his age and circumstances If it passed easily, thrice daily catheterization is probably best if only with difficulty it must be left indwelling, pending radical treatment of the cause of his condition the patient being covered against infection with chemotherapeutic drugs If a catheter cannot be passed suprapubic cystotomy is the only answer to the situation When, however retention is due to bilateral pyramidal lesions and a catheter passes easily, rather than risk repeated catheterization the internal sphincter should be divided *per urethram* After this operation the patient is often incontinent of urine at first and an indwelling catheter may be necessary for a while to obviate wet beds, but after a little a sufficient degree of control over micturition usually becomes established

Unconsciousness

Unconsciousness, failure of function of the higher centres in the brain may be due to many causes and the treatment of it must whenever possible, be directed to its cause Many pathological processes, however, lead to loss of consciousness because they cause rise of intracranial pressure and under these circumstances consciousness can often be restored and maintained by reducing it The methods of doing this have already been discussed under the treatment of vomiting always one of the first symptoms of raised intracranial pressure

An unconscious patient whatever the cause of his unconsciousness, runs three risks against which it is necessary to guard In the first place that of dehydration He does not drink and must be given at least four pints of water a day through a tube passed into his oesophagus through his nose *per rectum* or by intravenous or subcutaneous injection In the second he runs the risk of bronchopneumonia His respiration

must be treated so that the accumulation of katabolites and water in his body is reduced to a minimum This means keeping him at complete physical rest and supplying his basal metabolic requirement by giving him 100 G of fat emulsified in a litre of 25 per cent glucose in water through a stomach tube If for any reason it cannot be given by this route, then 45 per cent glucose should be given intravenously but, as this will thrombose most superficial veins, it must usually be given by means of a catheter passed into the superior or inferior vena cava so that it is immediately well diluted Small doses of insulin, which promote the rapid formation of glycogen which tends to use up any excess potassium, one of the most dangerous katabolic products, should also be given The use of the artificial kidney in cases of anuria is still in the experimental stage

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(and before that if the mass reflex is stimulated), gradually becomes established In incomplete transection the behaviour of the bladder is determined by the relative involvement of sensory and motor tracts respectively If his sensory tracts are mainly affected, his urine dribbles away continuously and an indwelling catheter, in spite of the risk of infection, may be the best solution of the nursing problem If his motor tracts are mainly affected, he will have retention Under these circumstances surgical division of his internal sphincter may result in the development of an automatic bladder If this fails, thrice daily catheterization, an indwelling catheter or suprapubic cystostomy are the only three solutions

Lower Motor Neurone Lesions

As soon as lower motor neurones have been divided or they and the anterior horn cells which give rise to them have been affected by some pathological process the muscles which they supply start to waste When therefore divided nerves have been sutured and in all other cases in which there is any hope of recovery, in poliomyelitis, for example, their nutrition must be maintained by massage and passive movements and those active ones which the patient can effect himself while the weight of his limbs is supported for him Treatment on these lines must be started as soon as possible (The degree of recovery attained in poliomyelitis is much greater in these days than when a passive attitude in its treatment prevailed) Direct electrical stimulation of the paralysed muscles is often also worth while Further, as it is often a year and sometimes two or three before maximal functional recovery has been achieved treatment on these lines must often be continued for at least as long In chronic peripheral neuritis recovery of function may take even longer

In chronic lower motor neurone lesions and as a sequel to acute ones unless special care is taken, contractures tend to lead to characteristic deformities These can only be prevented by splinting and mechanical devices, for example, an uplifting spring in foot drop and splints at night in wrist drop Alternatively the affected joints can be fixed surgically in positions of optimum usefulness or tendons from surviving and unimportant muscles transplanted to serve more useful functions

is often shallow and reflex control of his epiglottis and soft palate often depressed with the result that he may inhale instead of swallow his naso pharyngeal secretions and, if he starts vomiting (which is likely if his intracranial pressure is raised) he may inhale vomitus into his lungs He should therefore be kept lying flat and must be covered against bronchial infection with antibiotics If he actually starts vomiting, a tube should be passed and his stomach kept empty by suction drainage, in which case he will start losing salt, and the electrolyte position must be carefully watched Thirdly, he will probably retain his urine, and must be catheterized thrice daily under strict anti septic precautions All these problems will be further discussed under The Very Ill Patient" (page 397)

Upper Motor Neurone Lesions

In acute upper motor neurone lesions some permanent damage has always been done but the patient can be taught how to make the best use of the muscle which is still functional in his paralysed limb or limbs and to use his others in such a way as to compensate for the power he has lost For example, occupational therapy can teach a monoplegic patient how to make the best of a paralysed arm and physiotherapy re educate a hemiplegic one to walk once he has gained enough spasticity in his paralysed leg to support his body weight A speech therapist can help the aphasic patient to learn to talk again

Just as unconsciousness is often due to rise of intracranial pressure, so paraplegia is often due to pressure on the spinal cord and a decompression operation will often relieve it tem porarily even though the pathological process responsible for it is found to be inoperable Under the latter circumstances the patient eventually becomes bed ridden, as in a fractured spine dividing the cord He is now incapable of movement and often (depending on the extent of the lesion) insensitive to all forms of sensation in the lower part of his body, a combination of circumstances predisposing to bed sores which only good nursing can prevent (page 398) Further, he is bound to suffer from some disorder of micturition In sudden complete tran section of the cord he cannot pass his urine at first but, if he is catheterized regularly so that overflow is avoided, an automatic bladder, which empties reflexly at a certain intravesical tension

the testicles administration of the gonadotropic hormone by injection or an operation to free them is sometimes sufficient to restore both their endocrine function and the patient s fertility Primary or secondary hypogonadism in the female can be treated with hormones along the same lines Regular menstruation is usually established but the patient does not always become fertile

When destruction of the anterior lobe of the pituitary results in multiple glandular failure both cortisone and thyroid must be administered and it is possible to compensate for the inevitable lack of the growth hormone up to a point by giving testosterone (In women testosterone should be given in small doses combined with oestrogen) By this method a fair balance of endocrine function can often be achieved Diabetes insipidus due to deficiency of posterior lobe secretion, can be fairly well controlled by the patient taking pituitary snuff regularly or by injections of Pitressin tannate in oil

DISEASES DUE TO KNOWN CAUSES

When a disease is due, in the main at least to the operation of a single cause to the effect of an abnormal gene on development or to the action of some factor adverse to human health it can be prevented if its cause can be forced off the stage of human existence Infective disease can also be prevented if the natural resistance of the body can be raised sufficiently Further when a disease has actually started, the cause of it can sometimes be eradicated or the body helped to do that for itself, while the functional disorder resulting from it is kept under control by the methods described in the two previous sections When permanent damage has been done various devices can be employed to compensate for the resulting disability

Malnutrition and Deficiency Disease

The prevention of disease due to lack of those substances on which growth and nutrition depend (both can also be due to failure of absorption and to disorders of metabolism) depends on a number of factors Firstly, enough food of the right kind must be available (The balanced rationing of the nation was

Further, while in most upper motor neurone lesions paralysed legs provide rigid supports for the body, in lower motor neurone ones the paralysed muscles serve no functional purpose whatever The answer to paralysis of this kind is only to be found in metal supports, wheel chairs and other mechanical aids to movement

Failure of Endocrine Function

When an endocrine organ fails to produce enough of its hormone it is often possible to compensate for it, and keep the patient more or less symptom free, by administering it by mouth or by intramuscular, or in an acute case, intravenous, injection Large doses are required at first to get him back to normal and then small ones to keep him there (Grafting has been tried but proved unsatisfactory) 'Substitution therapy' is not generally applicable to all endocrine diseases however It works better in certain ones than in others and in some fails completely

Thyroid failure is easy to treat For thyroid extract, being resistant to digestion and rapidly absorbed from the gut, can be given by mouth Cretinism can almost be "cured (if diagnosed in time) and a patient with myxoedema can be quickly restored to and kept in health by feeding dried thyroid regularly But his cure is symptomatic only and, if he stops taking it, he relapses immediately In hypoparathyroidism (usually an acute condition due to inadvertent parathyroidectomy) tetany can be relieved by an injection of parathormone or by giving regular injections of calcium, and after that prevented by increasing the calcium and vitamin D content of the diet In acute adrenocortical failure dehydration due to loss of salt dominates the scene Saline must be given intravenously and cortisone started, the latter in large doses at first Order restored, much smaller ones will usually maintain it, although it is wise to increase the dose during any period of ill health and keep the patient's salt intake high by giving him sodium chloride in cachets

The physical signs of eunuchism due to destruction or atrophy of the testicles can be reversed by regular injections or occasional implantations of tablets of testosterone But the patient remains sterile When similar symptoms are due to delayed descent of

richer in protein and fat than human milk one part of water should be added to every two parts of it and a teaspoonful of sugar to every three fluid ounces of the mixture In addition the infant must be given fruit juice or a crushed tablet of ascorbic acid in each bottle, cow s milk being low in vitamin C content Solid food, egg, bread and butter vegetables and cereals, should be started gradually round the age of six months and the child completely weaned by the end of the ninth month of life Finally, it must be remembered that the surface area of an infant is large in relation to its weight and volume Not only does it lose heat but also water rapidly and must be kept plentifully supplied with fluid, particularly in hot weather and if, for any reason, it gets fever or diarrhoea

The growing child requires a higher proportion of protein in its diet than the grown man and, as already explained, relatively much more to eat its metabolic rate still being high to compensate for the rapid loss of heat from the relatively large surface of its body So free milk and cheap meals are provided in schools and the mother of a poor family must be taught to buy enough expensive first class protein and not economize too much by buying second class protein and much cheaper carbohydrate Too much money must not be wasted on sweets, and their consumption last thing at night one factor in the pathogenesis of dental decay must be forbidden All children now get enough calcium in bread and milk enough vitamin D in butter, milk and margarine and vitamin B will look after itself, but ascorbic acid tablets are a wise precaution in poor homes during the winter months

Except in poverty and very strenuous occupations (in these days of machines much less hard manual work is done) the average adult runs the risk of eating too much rather than too little Too high a consumption of fat is probably best avoided as it is a possible factor in the pathogenesis of atheroma, a high consumption of carbohydrate by anyone with a tendency to obesity A high protein diet seems to suit most people best (on account of the specific dynamic action of protein) and they feel fitter if they eat some meat, although vegetarians claim to keep themselves in perfect health without it Whether it is possible to eat too much meat is a difficult question Certainly the Registrar General s returns of deaths in relation to occupation suggest

particularly important during both World Wars when protein and total calories sank to within sight of their physiological minimum) Calcium is now put in bread, vitamin D in margarine and fluoride and iodide in salt Secondly, everybody must be able to buy at least that minimum which they require and this depends on employment at a living wage and unemployment benefit and old age pensions on a sufficient scale Thirdly, the preparation of food must not destroy vitamins, and cooking must be sufficiently good to stimulate appetite Fourthly, those in charge of institutions and mothers of families should know a little about the quantity and kind of food that the human body demands at different ages

The pregnant woman does not want more food than anyone else The excess food which any ordinary woman eats over and above her basic requirement easily provides for growth of her infant *in utero* Rather what she wants is better food, that is to say, more protein and less carbohydrate, a higher proportion of first-class protein and more calcium and iron for the development of bone and blood respectively These, iron excepted, are provided by increasing the proportion of milk and dairy products in her diet Meat and milk also supply the iron but, if she shows the least tendency to anaemia, ferrous sulphate should be given and a small daily dose can only be a fault on the right side During lactation, however, she does want more food, a higher calorie diet and a greater proportion of protein in it For now she must provide, not only for herself and a developing foetus, but for an active child that is maintaining its own metabolic rate and demands 30 Calories per kilogram of body weight and therefore needs 500 Calories a day Very soon it will want much more Further, both during pregnancy and lactation the vitamin content of her diet should be raised, particularly in respect of D and C But there is no point in giving excess of vitamins Rather that should be avoided There is some evidence derived from experiments on animals to suggest that excess of them early in pregnancy may lead to foetal malformation

Every infant should be breast fed, human milk being the perfect protein, fat and carbohydrate mixture for growth If it fails to gain weight because its mother s milk is insufficient in quantity, cow s milk must be given in addition, and, as it is

Physical Injury

The prevention of birth injuries depends on ante natal super vision and on a high standard of obstetric practice Abnormal presentations can then often be put right by external version This obviates the risk of a breech presentation with its attend ant danger to foetal life and the necessity to pull on an arm risking damage to the brachial plexus

The prevention of physical injury due to internal strains depends on preventing the circumstances under which they are likely to occur, the individual keeping himself reasonably fit and particularly as age advances, not attempting anything which might prove too much for the declining strength of his body

In order to prevent rupture of an intervertebral disc and displacement of its nucleus pulposus people should be taught to lift heavy weights, not by bending forwards and then attempting to straighten the back, but by flexing and then extending the legs at the knees In an acute case immediate hyper extension of the spine may effect a sudden cure the nucleus pulposus returning whence it came On the whole, however it is wiser to put the patient to bed on his back in extension for a few weeks, start him fairly soon on spinal exten sion exercises and then teach him to live with an extended back, i e picking things up by bending the knees and avoiding lounging back in comfortable chairs and motor car seats Most cases recover on treatment on these lines If, however his pain returns on getting up a further period of rest is necessary and when he is allowed up now it must be in a plaster jacket to limit the mobility of his spine After a while the jacket should be tried off and a spinal belt substituted for it the patient again being careful to live in extension If he still suffers pain, the only way to control it now may be a permanent plaster jacket but it is in these cases that, if a myelogram shows a definite filling defect in the spinal canal, laminectomy at the appropriate level and excision of the displaced nucleus pulposus may effect a complete cure

An inguinal hernia is a potentially dangerous condition If left alone not only does it tend to grow larger as time goes on, but any gut in it may become obstructed or its vessels strangulated

that those engaged in trades associated with the habitual eating of large meals, restaurant keepers for example, die relatively young But this may be due to high consumption of fat rather than of protein, or even to too little physical exercise (Too much was at one time blamed for arteriosclerotic disease) All *that can really* be done in our present state of ignorance of the factors in diet which influence health is to advocate moderation in every direction including vitamins, in short encourage a diet well adequate in calories and as varied and well balanced as individual circumstances permit

The actual treatment of malnutrition is seldom difficult That item which is lacking must be immediately supplied, at first in rather large quantity to make good arrears and after that in sufficient quantity for daily growth and maintenance For example, a patient s protein intake must be stepped up or his total calorie intake raised, or he should be put on iron, pending the effect of eating more meat and vegetables, or on calcium and vitamin D, pending the consumption of more milk and cheese Scurvy quickly responds to ascorbic acid *and beri* beri to aneurin Rickets will take longer to 'get right' and the child must be kept off its legs until ossification of bone has caught up with its weight When a patient fails to respond to any of these measures, not deficiency in diet but failure of absorption from the gut should be suspected

The treatment of severe starvation is difficult as the gut becomes intolerant of food and feeding leads to diarrhoea Many of the prisoners rescued from Belsen at *the end of the* war died on this account Intravenous feeding with hydrolysed protein was tried but stimulated pyrexial reactions and proved practically useless Only glucose can really be given intra venously So the best method of handling the situation is to feed by the mouth, giving very small feeds at frequent intervals at first and beginning with the monosaccharides and gradually working up to protein and fat in the form of diluted milk The leeway in respect of iron, *calcium and vitamins* must also be made good The treatment of dehydration, which is rarely due to failure to get water (the starved man, until he becomes too weak to move, has usually *had access* to that), will be discussed under the management of the very ill patient

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In any severe accident the injured man should be laid out flat on his back and his limbs pulled out straight (The first reaction of the layman is to pick him up and this may be dangerous if serious damage has been done particularly if his spine has been fractured) Two possible causes of rapid death, arterial haemorrhage and respiratory obstruction may now demand immediate action The first can often be stopped (if artery forceps are not available) by pressing the damaged artery against bone above and as near as possible to the site of the haemorrhage (knowing the pressure points is first aid knowledge that every layman should possess) while someone else applies an improvised tourniquet if the site of the bleeding permits The second only likely in a severe facial injury leading to fracture of the jaw, must be countered by pulling the tongue forward and keeping it forward (a man thus injured tending to swallow it, obstructing his air way) until help can be obtained Venous bleeding can now be stopped by tight bandages and any fracture immobilized by make shift splints to prevent it becoming compound or if already compound to prevent it causing any further damage to soft parts If his spine has or may have been fractured it must be kept extended by means of a pad under his lumbar region Finally, he should be kept warm and got to hospital as quickly as transport is available

On arrival he must be treated for shock This may be largely emotional, primary shock He should be kept lying down to ensure that fall in blood pressure does not result in syncope and adequately comforted in body and mind until his vaso-motor tone is restored The traditional cup of hot, sweet tea should not be given until natural recovery is certain and it is clear that no anaesthetic will be required Alcohol should be avoided unless he is going straight to bed, in which case it can be given as a sedative although a small dose of bromide, chloral or barbiturate is just as effective

True or secondary shock which may develop gradually on primary shock, is a more serious matter Vaso motor tone fails to recover spontaneously and the cardiac output does not increase sufficiently to maintain the patient s blood pressure which remains low so that his vital tissues particularly his

Something must always be done about it soon It can usually be reduced and in a child a period of rest in bed *may* then lead to natural recovery In an adult this cannot be expected, and a plastic operation is necessary to effect a radical cure but it is quite useless to attempt it in an elderly person in the face of a chronic cough The repaired inguinal canal will never stand the strain of repeated rise of abdominal pressure on this account Under these circumstances the only course of action is to keep it under control by means of a well fitting truss A femoral hernia should always be repaired as a truss will not control it and it inevitably strangulates sooner or later, particularly in elderly patients

The action of gravity on the body must sometimes be countered For example, airmen must wear pressure suits and the position of the body must often be deliberately altered, 'feet up' to get the arterial blood to the head or the venous blood back from the legs, 'head down' to get the sputum up from the lungs The consequences of gravity must also often be remedied, for example, uterine prolapse, by a plastic operation or by some kind of mechanical support, i e colporrhaphy, or wearing a vaginal pessary Varicose veins, in which the blood flows downwards when the patient is standing, interfering with the nutrition of the leg, often calls for treatment Sometimes an elastic stocking and walking about solves the problem In other cases drastic action is required, the choice lying between injection, tying and excision Injection with coagulants is not very successful, the obstruction produced by the resulting thrombosis is often incomplete or the vein soon canalizes again Suture must be in several places to be effective on account of anastomosing channels and always at knee *and* femoral ring levels In practice it proves more satisfactory to excise the whole dilated vein obliterating all alternative routes along which the blood might flow

The prevention of accidents of all kinds is the responsibility of the Home Office and much depends on maintaining a high standard of sense of responsibility among drivers of motor vehicles and educating pedestrians and cyclists, particularly children, in road sense Further, not only is the death and injury rate on the roads high, but the chance of a child being killed by an accident in its home by a burn or some electrical

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brain and kidneys, may suffer permanent damage from inadequate oxygen supply In addition, the volume of his circulating blood is usually reduced, because *plasma is lost* into his tissue spaces, serum exudes from some injured surface or he actually continues bleeding So he must be nursed flat, or with his legs and body raised above the level of his head, to ensure that the blood pressure still being maintained at least gets blood up to his brain, and his blood volume quickly increased by rapid intravenous transfusion A normal saline drip may suffice if the degree of shock is not severe, but blood is usually necessary if his blood pressure is to be maintained And there is little danger of giving too much In most injuries blood loss is greater than appears and in a severe one a quantity equal to half the normal volume of it in the body may be required Further, transfusion must be continued as long as the patient continues bleeding and, when blood has of necessity been given at once, some saline should *always* be given as soon as normal blood pressure has been restored For the natural reaction of the body to bleeding is to maintain its blood volume by mobilizing its tissue fluids and this debt must clearly be repaid Pain must also be relieved (shock is partly due to it) Morphine should therefore be given either by intramuscular or intravenous injection (it may not be absorbed from under the skin) as soon as possible Finally, as soon as the patient is well enough, he should be encouraged to drink, not only to ensure that his kidneys start to function properly again and excrete any accumulated toxic products, but also to allow his body to correct any tendency to unsuspected dehydration

As soon as he has recovered sufficiently from secondary shock, and particularly if a limb has been seriously damaged, an anaesthetic will almost certainly be required while the nature and extent of his injuries is ascertained, with a view to the immediate therapeutic action necessary, the so called debridement of the wound Sometimes it is found necessary to amputate a limb and if possible a wound which has been much contaminated by dirt should be excised Divided tendons and nerves must always be sutured and all tissues, skin, muscle, even bone which have no hope of recovery cut away as amino acids are rapidly absorbed into the blood from damaged and devitalized tissue and are an important factor in

the pathogenesis of secondary shock Further, they may lead to nephritis and complete anuria Tourniquets cannot be released until this has been done and when at last released (they must be released as soon as possible), the necessary steps must be taken to arrest arterial and venous bleeding permanently Then penicillin or sulphonamide powder is dusted liberally into the wound and healthy skin edges drawn as close as possible over any damaged surface (Skin grafting will be considered later although in these days this is often done quite soon) Finally, the patient is given a large dose of anti tetanic and anti gas gangrene serum and covered against septic infection with chemotherapeutic drugs

It must also be remembered that in certain types of injury a patient may be bleeding internally

If his breathing is embarrassed a lung may have been damaged, and is now full of blood or rupture of an intercostal artery may have caused extravasation of it into a pleural cavity leading to a positive pressure haemothorax In the former case the blood must be sucked out through an endo tracheal tube, in the latter the bleeding artery found and tied, the chest aspirated and, if the lung has been perforated into the pleural cavity continuous negative pressure maintained If on the other hand, physical signs are found in the abdomen and particularly if his general condition suggests that he has lost more blood than is externally apparent he has probably bled into his peritoneal cavity from a ruptured solid viscus Under these circumstances his abdomen must be opened quickly A spleen will be removed If his liver has been damaged, bleeding must be stopped by suturing it Haematuria would point to damage to a kidney This may also necessitate an exploratory operation and if need be, a damaged normal kidney must be sacrificed to stop the bleeding

When the level of consciousness of a patient who has had a head injury slumps and particularly if his blood pressure is well maintained, his pulse is slow and signs are found in his nervous system, he must have bled inside his skull with the result that his intracranial pressure is rising For in the skull as in the chest, haemorrhage has mechanical consequences which far outweigh those merely due to loss of blood The right action under these circumstances depends on a correct assessment

of the intracranial situation If the rise of pressure seems relatively slow, bleeding is probably from a vein, sub dural haemorrhage, and burr holes and aspiration of the clot will relieve the pressure sufficiently until it stops naturally If, on the other hand, the intracranial pressure is clearly rising fast it is probably from an artery, meningeal haemorrhage His skull must be trephined and the bleeding branch of the middle meningeal quickly found and tied *

A patient who survives haemorrhage and shock may still, it *must be remembered, die of infection due to rupture of a* hollow viscus (This it is not always easy to spot while he is still in a condition of shock) So if there is any reason at this stage to suppose that his gut has ruptured into his peritoneal cavity, or his bladder into his retroperitoneal tissue, he should be put on antibiotics and, as soon as his general condition permits, his abdomen opened and explored

A dislocation can usually be easily reduced The treatment of fractures is more difficult They must be set, i e the two parts of the broken bone brought into correct alignment and fixed in splints or plaster In the case of the fracture of the long bones near their middle this is comparatively simple The two parts can be manipulated into the right position, which is checked by X ray examination When, however, a fracture is near a joint, for example of the neck of the humerus or femur, it is impossible to control the position of the upper fragment which is pulled into a certain position by the muscles attached to it Under these circumstances, on the principle that if the mountain won t come to Mahomet, Mahomet must go to the mountain, right alignment can only be effected by bringing the lower fragment into the position which corresponds with the enforced position of the upper one Hence the reason why after certain fractures limbs must be immobilized in very strange positions But, if this is done, most fractures unite in course of time In certain ones, particularly those of the neck *of the femur in elderly people, it is necessary to pin the bone,*

* In the treatment of haemorrhage due to other causes the same principles apply The bleeding point must be secured or the whole organ containing it excised For example in sub-arachnoid haemorrhage (one cause of rapid loss of consciousness) the aneurysm if it can be located by arteriography can sometimes be tied or clipped in haemoptysis from a tuberculous or bronchiectatic cavity bleeding can sometimes only be stopped by lobectomy or induction of a pneumothorax. The treatment of gastro-duodenal haemorrhage is discussed later

and sometimes bones are united by the use of silver or in these days, plastic plates Methods of this kind are, however, out of the question in all compound fractures on account of the risk of infection of the bone

A clean cut heals by first intention and even an infected wound, if sepsis can be kept under control gradually granulates up from the bottom leaving a depressed scar Sutured muscle and tendons unite by the formation of fibrous tissue and may become almost as strong and efficient as before A broken bone, provided it is kept still and in the right alignment, throws out callus and in the space of six weeks to three months should unite with little deformity During the period of enforced rest, however the muscles which operate it at its joints to other bones waste rapidly away If a nerve has been cut the muscles it supplies waste still more rapidly away but the fibres in the central end taking the persistent neurilemmal sheath in the peripheral end as their guide (hence the importance of suturing central and peripheral ends together) grow down until they reach the muscles they supply restoring motor function But this is a very slow process and in the case of a large nerve requires at least a year In all fractures and nerve injuries, therefore particularly the latter active steps must be taken to *maintain* the nutrition of the muscles As soon as possible splints must be removed daily and the muscles exercised Finally if a severe injury leaves serious disorder of function in its wake, rehabilitation may be necessary to get a man back to a working life He must be taught to use what muscles he has left or how to work on some new job in the face of some permanent disability Occupational therapy and re education in some new technique may be necessary

The prevention of burns a common variety of serious and sometimes fatal accidents depends on the stringency of Home Office regulations and family and individual care and common sense It is hardly necessary to elaborate these points save to underline the risk of electric and gas fires at floor level, inflam mable clothing materials, particularly in nightdresses, and the looking glass just above the mantelpiece (into which the patient was looking when her nightdress caught fire) and the saucepan on the kitchen stove with the toddler playing on the floor

Burns of the third degree are characterized by destruction of

superficial tissues but in spite of that it may be difficult to assess their extent or to be sure to what depth they have penetrated Further, they are associated with great pain and profound secondary shock which always calls for vigorous treatment on the lines already indicated Even a burn of the second degree, i e blistering the skin by leading to extravasation of fluid between dermis and epidermis, may be fatal on this account if it involves half the surface area of the body Further all burns become infected sooner or later and whenever possible burnt tissue should be excised from a wound, particularly as there is no specific treatment for burns as opposed to other types of physical injury (The use of tannic acid to form a protective crust has long since been abandoned) Nevertheless, a burn must usually be covered with a dressing, on the one hand to protect it from the bandages, and on the other to *prevent infection For this purpose ' tulle gras gauze impreg* nated with petroleum jelly, is far the best It absorbs exudate On the other hand, it does not stick so that it can be lifted off without causing pain or damaging granulating tissue or epith elium when it starts to form

The prevention of frost bite on polar and mountain expedi tions is again a matter of common sense in respect of the degree of risk likely to be encountered Impending frost bite can be warded off to some extent by friction When it actually occurs it is wiser to let the whole depth of the area affected thaw slowly and simultaneously rather than to thaw out the surface first Under no circumstances must heat ever be applied The restoration of damage done depends on the same principles and methods as are applicable to physical injury

The prevention of over exposure of the body to ionizing radiation, particularly the gonads, is most important Reference has been made to it repeatedly already The body must not be over exposed to X rays either for diagnostic purposes or in treatment Exposure time must be recorded and therapeutic doses carefully calculated Those habitually exposed must take the necessary precautions Radiologists must wear lead impregnated aprons and gloves and should have their blood examined at intervals At the first suggestion of any tendency to aplasia of the blood cell forming elements in the bone marrow or of the liberation of primitive white cells into the

blood they must be removed to a different environment Atomic *tests must be suspended as soon as possible to prevent the rising* dose of ionizing radiation to which all mankind is now exposed and a watch kept on the amount of strontium resulting from atomic fall out found both in articles of food particularly rice and water and, in consequence, in human bones Should a person be subjected to an overdose inadvertently replacement of his bone marrow by transfusion of normal marrow cells from a donor can be considered Should atomic warfare start and a person escape the effect of blast in the open, immediate *washing of his whole body to get rid of fall out would* be most important Pyridoxin would be of some use in the treatment of the violent radiation sickness likely to ensue but there would be no treatment for the aplasia of the bone marrow (other than repeated transfusion and possibly marrow grafting) the leukaemia, the depilation of the skin the radiation burns and the sterility which could result Nor would there be any method of preventing the genetic defects, fortunately likely to be recessive and correspondingly infrequent which it is believed might be handed down to future generations

Chemical Poisoning

Traffic in the drugs of addiction is controlled by international convention and the sale of dangerous drugs by law, the Home Office maintaining an official Poisons List This includes, not only the former, but all dangerous drugs used in medicine and all dangerous substances used in industry and agriculture Any new substance is put on it as soon as its dangerous properties are recognized

Drugs on the Poisons List cannot be obtained except on a doctor s signed prescription which must make clear the exact quantity to be dispensed Further the doctor who wrote it must be known to the pharmacist who dispenses it and the patient to the pharmacist who must be reasonably sure that the prescription will be used by the person for whom it was intended The pharmacist and a doctor too if he does his own dispensing, must keep an exact record of all the dangerous drugs which he dispenses The law also demands that all prescriptions containing dangerous drugs must be distinctly labelled and medicines containing them are often dispensed in blue bottles

so that they can be recognized at sight, and often in hexagonal ones, so that they can be recognized in the dark. Nevertheless, the drugs of addiction can still be obtained, in spite of police vigilance, on the black market. So addiction still occurs and the Home Office maintains a list of registered addicts who are allowed without question the amount of the drugs which they require. Barbiturates can be obtained with still less difficulty, and the incidence of accidental poisoning and attempted and successful suicide by their means still remains high.

The prevention of poisoning in industry is also the responsibility of the Home Office which has the power to insist that the necessary precautions are taken in all industrial operations recognized to be chemically dangerous to human health. All cases of chemical poisoning of certain types must be notified and trained inspectors visit factories to see that these regulations are enforced. They also make a special investigation of the health of the employees and the conditions under which they work wherever a case of industrial disease has been reported. In this way, although chemical risks in industry have increased of recent years, industrial health is steadily improving.

If a poison other than a corrosive has just been swallowed, an attempt should be made to get rid of it forthwith. A household emetic, mustard or salt in water, should be given immediately, but they, and even the pharmacological emetics such as apomorphine, are unreliable in their action. So, if a stomach tube is available, it should be passed at once and the stomach washed out with the appropriate antidote, for example, white of egg and milk in acute mercurial poisoning to form an insoluble albuminate. A full list of antidotes will be found in the *British National Formulary* which every student and doctor should carry in his pocket.

In corrosive poisoning, a stomach tube being much too dangerous (as liable to lead to perforation), it is necessary to rely entirely on inactivating the poison. If an acid has been swallowed, the patient should be made to drink a pint of water containing magnesium oxide or hydrated lime (carbonates should be avoided as the sudden evolution of gas resulting might be dangerous), if an alkali, it should be diluted and neutralized by giving the patient a pint of water containing acetic acid, vinegar or lemon juice. Meanwhile pain and

shock must be treated as the condition of the patient demands

If a poison can neither be got out of the stomach nor inactivated in it, or attempts to deal with the situation on these lines are only partially successful, it is sometimes still possible to inactivate it after it has been absorbed For example dimercaprol (B A L, British anti lewisite) given by intramuscular injection is of some value in acute and chronic poisoning by mercury antimony, bismuth, arsenic and gold Sodium calciumedetate is valuable in acute and chronic lead poisoning and is given intravenously Bemegride and amiphenazole given intravenously are of some value in the treatment of acute barbiturate poisoning and anti venoms are available for certain kinds of snake bite

Elimination must always be encouraged Some poisons leave the body through the lungs, notably the volatile anaesthetics and carbon monoxide For the second the patient must be made to breathe deeply by giving him five per cent CO_2 in oxygen (if he has stopped breathing artificial respiration must be started) the former to increase his depth of breathing the latter to displace carbon monoxide from combination with his haemoglobin (A replacement blood transfusion is indicated theoretically but in practice rarely attempted) Most poisons are eliminated by the renal route So the patient should be plied with fluids to increase his excretion of urine and in every severe case an intravenous drip is necessary to control the situation This, once set up, fulfils many purposes Antidotes can be got into the system The rate of excretion of urine can be increased Loss of water and electrolytes, if vomiting or diarrhoea sets in, can be countered Drugs can be given quickly to maintain any vital function which shows signs of failing

In poisoning, corrosive poisoning (which is a form of physical injury) excepted, some vital function is failing and must be maintained while the poison is destroyed in the gut detoxicated in the blood or eliminated by the kidneys or lungs The most common is depression of consciousness The patient should be walked about to keep him awake and cerebral stimulants such as nikethamide, picrotoxin and amiphenazole injected If he lapses into coma, his air way must be kept clear If his breathing stops (this is particularly likely in carbon monoxide and

so that they can be recognized at sight, and often in hexagonal ones, so that they can be recognized in the dark. Nevertheless, the drugs of addiction can still be obtained, in spite of police vigilance, on the black market So addiction still occurs and the Home Office maintains a list of registered addicts who are allowed without question the amount of the drugs which they require Barbiturates can be obtained with still less difficulty, and the incidence of accidental poisoning and attempted and successful suicide by their means still remains high

The prevention of poisoning in industry is also the responsibility of the Home Office which has the power to insist that the necessary precautions are taken in all industrial operations recognized to be chemically dangerous to human health All cases of chemical poisoning of certain types must be notified and trained inspectors visit factories to see that these regulations are enforced They also make a special investigation of the health of the employees and the conditions under which they work wherever a case of industrial disease has been reported In this way, although chemical risks in industry have increased *of recent years, industrial health is steadily improving*

If a poison other than a corrosive has just been swallowed, an attempt should be made to get rid of it forthwith A household emetic, mustard or salt in water, should be given immediately, but they, and even the pharmacological emetics such as apomorphine, are unreliable in their action So, if a stomach tube is available, it should be passed at once and the stomach washed out with the appropriate antidote, for example, white of egg and milk in acute mercurial poisoning to form an insoluble albuminate A full list of antidotes will be found in the *British National Formulary* which every student and doctor should carry in his pocket

In corrosive poisoning, a stomach tube being much too dangerous (as liable to lead to perforation), it is necessary to rely entirely on inactivating the poison If an acid has been swallowed, the patient should be made to drink a pint of water containing magnesium oxide or hydrated lime (carbonates should be avoided as the sudden evolution of gas resulting might be dangerous), if an alkali, it should be diluted and neutralized by giving the patient a pint of water containing acetic acid, vinegar or lemon juice Meanwhile pain and

avoiding the cause of it, namely, attempting to desensitize him, antagonizing the action of histamine (the main cause of his symptoms) and blocking the antigen antibody reaction in his tissues by raising the steroid (cortisone) content of his blood

When the specific antigen can be discovered and the acute attack is over, desensitization is often worth attempting as in hay fever, horse asthma and hypersensitivity to articles of diet which cannot be avoided The antigen should be given starting with very small but in rapidly increasing doses, and in the prophylaxis of hay fever a course should be started each year in the early spring An attempt can also be made to desensitize to a drug, for example, penicillin although it is usually wiser to avoid giving it When, as in most cases of allergy the specific antigen is not known, it is necessary to resort to one of the two other methods of proceeding, namely, antagonizing histamine and/or blocking the reaction between antigen and antibody In a really acute attack immediate steps must also be taken to maintain vital function

In anaphylactic shock an injection of adrenaline should be given immediately to restore vaso constriction followed by intravenous noradrenaline or methylamphetamine Adrenaline is also the best immediate treatment in acute bronchial asthma In subacute and chronic sensitivity (allergic) conditions the antihistamine drugs, namely diphenhydramine mepyramine and promethazine, work better They can be applied to the skin, dropped into the nose or eye and administered by the mouth In acute conditions such as oedema of the naso pharynx threatening the patient s air way they must be injected intramuscularly

When antihistamines fail steroid therapy must be considered although once started it is difficult to stop There are two alternative methods of proceeding the adreno cortico trophic hormone (A C T H) by injection and cortisone or one of the steroid compounds allied to it, by the mouth A C T H stimu lates the adrenals to produce cortisone so that it can be with drawn without fear of hypocorticalism On the other hand, the rise of cortisone content of the blood effected cannot be gauged When cortisone is used the rise in content of the blood must be more or less proportional to the dose but it leads as would be expected, to suprarenal atrophy, and can only be withdrawn

barbiturate poisoning), artificial respiration must be started In strychnine poisoning, on the other hand, hypnotic drugs must be given or the patient kept under an intravenous or volatile anaesthetic to control his fits In acetylsalicylic acid (aspirin) poisoning it may be necessary to give dilute sodium bicarbonate intravenously to stop dangerous hyperventilation of the lungs If the patient is vomiting or diarrhoea sets in, steps must be taken to maintain the water and electrolyte content of his body

Cases of attempted suicide by chemical means and the treatment of drug addiction constitute special problems The mind has to be taken into account as well as the body Attempted suicide may be due to reactive but more commonly to endo genous depression The addict is usually a psychopath and admission to an institution is necessary in the first instance where the drug, be it morphine, cocaine or alcohol, must be slowly withdrawn under the cover of sedatives At the same time an effort is made to reorientate his attitude to life, to get him interested in things and gradually to restore his self respect But the relapse rate is very high and cocaine addiction almost impossible and morphine addiction difficult to cure (In some mysterious way the addict usually manages to keep himself supplied) For the chronic alcoholic, provided degeneration of his brain and mind has not progressed too far, there is more hope Further, disulfiram (Antabuse), if the patient can be persuaded to take it regularly after he has been weaned off his drink, is of some use For it reacts with any alcohol taken by mouth to produce acetaldehyde within the body with leads to violent vomiting and collapse There are also societies, notably Alcoholics Anonymous, who set out to try to help these people

Idiosyncrasy and Sensitivity

There is no known treatment for idiosyncrasy to inorganic chemical substances, for example, iodine and the heavy metals, or to the simpler organic substances, for example, acetylsalicylic acid and quinidine The only course of action is to avoid using them, and in the case of some drugs, quinidine, for example, it is advisable to give the patient a test dose before embarking on a full course Idiosyncrasy overlaps allergy however Here there are three possible courses of action apart from the patient s

avoiding the cause of it, namely, attempting to desensitize him, antagonizing the action of histamine (the main cause of his symptoms) and blocking the antigen antibody reaction in his tissues by raising the steroid (cortisone) content of his blood

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slowly In an emergency cortisone must be given, but for prolonged administration A C T H is safer, although a combination of A C T H and cortisone sometimes seems to work best Both have unwanted side effects against which it is necessary to guard however They lead to retention of sodium and therefore to retention of water, gain in weight and oedema, and to loss of potassium and therefore to muscular weakness (Certain steroids allied to cortisone are much less salt retaining and potassium depleting) They also tend to cause rise of blood pressure, hyperglycaemia and glycosuria, "moon face and, in people predisposed in that direction, psychotic symptoms Further, they all inhibit the normal reaction of the body to infection So steroid therapy should only be started on a patient with a tendency to bronchitis with caution, and then usually under chemotherapeutic cover, and never in any patient before an X ray of his chest has excluded active pulmonary tuberculosis Further, it aggravates any gastric or duodenal ulcer tendency (in which it may precipitate perforation or haemorrhage) and predisposes to bed sores

Infection

Infestation by surface parasites, body lice, pediculi capitis and pubis, and the acarus of scabies, and fungus infections, such as tinea capitis and pedis, can be prevented by hygienic living, personal cleanliness and avoiding direct contact and sometimes, as in the case of tinea pedis (as dirty floors cannot always be avoided), by keeping the skin protected by dusting between the toes with fungicides Infestation by some intestinal parasites can only be prevented by stopping the larvae penetrating the skin, ankylostomiasis, for example, by avoiding bathing or standing in infected water or, if a man must stand in it, by seeing that he wears rubber boots, others by avoiding contact with their intermediary hosts, for example, filariasis by protection from infected mosquitoes, and hydatid disease by not fondling dogs in countries where it is endemic The human tape worm and cysticercosis are only prevented by cooking pork, which may contain the encysted larvae of the parasites, sufficiently, and the prevention of round worm and thread worms depends on preventing infection and reinfection by the mouth

Body lice are eliminated by heating the clothes to a sufficient temperature, pediculi capitis and pubis, acarus and fungus infection by attention to the hair and skin In the case of pediculi capitis ordinary antiseptics of the phenol group suffice In that of pediculi pubis it may be necessary to shave *the skin and apply insecticides The mites causing scabies are* killed by benzyl benzoate Intestinal worms demand some chemical substance which kills them without at the same time damaging the mucous membrane or upsetting the functions of the gut, tapeworm extract of male fern, hook worm, ankylostoma tetrachlorethylene, round worm, hexylresorcinol or oil of chenopodium threadworms, piperazine Nevertheless worms can be difficult to eradicate The head of a tapeworm may hang on after it has lost all its segments and then these grow again *(Purgation is therefore required before and after* administration of the vermifuge) Children with threadworms keep reinfecting themselves with their fingers from anus to mouth and common sense steps must be taken to prevent it There is no satisfactory permanent treatment for ankylosto miasis and reinfection in endemic areas is common Prevention is therefore most important A hydatid cyst must be excised if it becomes infected or leads to pressure symptoms

The incidence of bacterial infection can be reduced by dimin ishing the chances of pathogenic organisms coming into contact with man All serious infectious diseases with the exception of the venereal diseases are now notifiable (Compulsory notifica tion of the latter would help to control their spread but the social stigma attached to them is too great to permit it) In the case of some smallpox and diphtheria for example, a Medical Officer of Health has power to remove a patient to hospital if he cannot be nursed safely in his own home (In point of fact most patients suffering from serious acute infectious disease are ready to enter hospital when so advised) Tuberculosis is notifiable but public opinion will not stand for treating patients with it as lepers were treated in the Middle Ages So the State maintains public health officers who visit the patient, arrange hospital treatment for him if necessary in his interests, or supervise his treatment as an out patient teaching him how to order his life so as to remain a minimum danger to other people

Much can be done to prevent infection by the supervision of

milk, water and food the tuberculin testing of dairy herds has practically eliminated tuberculosis of bone As the result of control of water supplies typhoid fever (the occasional epidemic is invariably due to a breakdown in sanitation or to sewage seeping into the water in which milk bottles are washed or into watercress or oyster beds) is now rare The incidence of food poisoning (staphylococcal and dysenteric) has been much reduced by cleanliness on the part of those engaged in the preparation of food Much, too, has been done by the elimination of insect and animal carriers, for example, getting rid of pools where mosquitoes breed has helped to reduce the incidence of malaria and yellow fever, getting rid of rats and their fleas that of plague and spirochaetal jaundice, getting rid of lice that of typhus and other Rickettsial diseases Finally, there is the detection and treatment of human carriers, notably carriers of typhoid, diphtheria and, in epidemics, meningococcal meningitis

Nevertheless it is impossible to eradicate any pathogenic organism completely So steps must be taken to raise resistance to infection In respect of tuberculosis an adequate diet is particularly important The incidence of it increased in all the blockaded countries during the two World Wars Resistance to many infections can also be temporarily raised by chemo therapeutic cover' for example, taking a malarial suppressive regularly *in a mosquito ridden country, protecting a patient* with a rheumatic heart, who must have a tooth out, against non haemolytic streptococcal infection by the prior administra tion of penicillin Antitoxin can also be used to provide tem porary passive immunity A man who has been seriously injured must be "covered against the risk of tetanus and gas gangrene by giving him a dose of both antitoxins, and the uninoculated child caught ' in an epidemic of diphtheria protected against the immediate risk of getting it with a dose of diphtheria antitoxin

Active immunization is the ideal at which to aim Then there is no necessity to go on taking anything (which may be for gotten) and it lasts much longer than passive immunization, for several years as compared to a few weeks Unfortunately there is no standard way of doing it and many different methods are employed To immunize actively against diphtheria and

tetanus, toxoid is injected, i e toxin chemically treated in such a way that it loses its pathogenic but retains its antigenic properties Typhoid is prevented by inoculation with chemically killed bacilli which also retain their antigenic properties Resistance to tuberculosis cannot be raised in this way The only way of doing that, and it is now being done on an increasing scale, is by inoculation with living bacilli which have been grown for a long time on a special medium (B C G vaccine) Smallpox is prevented by inoculation of the live virus of a related disease, vaccinia (believed to be due to a mutant of either that of smallpox or cowpox) into the skin In the prevention of poliomyelitis at present the dead virus is injected

In acute infection recovery can usually be left and, in infections for which no treatment yet exists (now practically only the virus diseases), must be left, to nature All cases of mumps and chicken pox most of measles and whooping cough and the majority of influenza and streptococcal throat recover without specific treatment So, too with most cases of local infection A boil comes to a head and bursts An abscess left to itself works to the surface points and discharges Only in a dangerous place, like the abdomen and brain is surgical drainage urgently and absolutely necessary but in practice most abscesses are opened and the pus let out, as soon as pus has been formed, thereby shortening the patient s illness The *premature* incision of an inflamed area is however, peculiarly dangerous as likely to spread infection before it has been walled off by an adequate inflammatory reaction

In acute infection, therefore, the body should often be given every chance to recover naturally In the case of general infection the patient must be put to bed and maintained in body and in mind as will be described under The Very Ill Patient (page 397), the amount of care and attention bestowed on him depending on the nature, severity and probable duration of his illness In local infection the inflamed part must be kept quiet for example, a septic hand is put in a sling and in subacute tuberculous cervical glands the neck in a plastic collar The only way in which to rest the heart and kidneys is to keep the patient in bed but a tuberculous lung can be rested at the expense of extra demand on the other by relaxing it If the disease is mainly apical air is injected into that pleural cavity

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commoner but less serious one of serum sickness, both being particularly likely in a patient who has had horse serum before or who gives a clinical history of sensitivity (allergic) disease Under these circumstances, if time and his condition permit an intradermal test dose is wise and then, if positive antitoxic serum should be given more slowly or desensitization attempted But in a severe case the risk of immediate large doses must be taken, with adrenaline and an antihistamine suitable for intra venous *injection at hand When in a severe case of serum sickness* antihistamine drugs fail the use of cortisone should be considered

The diphtheria bacillus may continue to live in the throat long after an attack of diphtheria is over Further some people who have never had diphtheria carry pathogenic bacilli in their throats *and are immune to it themselves on account of antitoxin in their blood So the problem of the diphtheria* carrier sometimes arises The therapeutic attack must now be levelled at the bacilli themselves A combination of penicillin and a sulphonamide or tetracycline usually prove effective

When there is no toxin in the blood susceptible to specific serum therapy *the therapeutic attack must also be levelled* against the infecting organisms direct Wanted in respect of every infection is some chemical substance which will alter the chemical environment of the body in a direction hostile to the infecting organisms and yet not upset the body as a whole or any one of those functions on which its general well being depends Wanted in fact is the perfect weed killer in the complex garden of the human body Then the only problem which remains although it may still be a considerable one, is to effect, as quickly as possible and maintain as long as is necessary, a sufficient concentration of it at the site of infection to kill the offending organisms (bactericidal action) or stop them reproducing (bacteriostatic action) without at the same time causing any serious disturbance of bodily function

Chemotherapy, as thus defined, antedates the dawn of human history quinine having been used in the treatment of fever for centuries (although it has been but recently discovered that it is only really effective in malaria) Then in the fifteenth century mercury was introduced as a specific remedy for syphilis which was rapidly spreading across Europe at that time

(pneumothorax) or the upper ribs excised and the chest allowed to fall in (thoracoplasty), if mainly basal, the phrenic nerve is avulsed, i e pulled out, on that side in order to paralyse that half of the diaphragm and air injected into the peritoneum under it (pneumoperitoneum)

The natural reactions of the body must also be encouraged Fever, unless it rises above 103° or 104°, should not be suppressed (antipyretic drugs are to be avoided), but there is no known way of stimulating fever, except by the injection of foreign protein intravenously, and this is reserved for chronic cases and practically only employed now in the treatment of rheumatoid arthritis Inflammation can be encouraged by the application of heat Fomentations are still the time honoured method of doing it Magnesium sulphate compresses are sometimes employed to localize inflammatory oedema

Areas of very chronic inflammation, for example, the tonsils, a Fallopian tube an ovary and the apex of a lung can be excised *in toto* On the other hand, as inflammation becomes chronic the formation of fibrous tissue may begin to lead to unnecessary structural change and in the central nervous system interfere with the free flow of the cerebro spinal fluid Under these circumstances cortisone, which inhibits the reactions of the body (and therefore facilitates acute infection), must sometimes be used to prevent it in combination with some chemotherapeutic agent

In diseases due to liberation of toxin the body responds by producing specific antitoxin But this is a slow process and it may be overwhelmed before enough has been produced So in diphtheria, tetanus and gas gangrene the therapeutic attack should be directed not against the bacilli in throat and wound respectively, but against the rising concentration of the toxin in the blood (Staphylococcal antitoxin was used at one time but has now been replaced by a chemotherapeutic attack against the organisms themselves) The natural defences of the body should be heavily reinforced immediately by the administration of very large doses of preformed antitoxin (derived from horses injected with increasing doses of toxoid) intravenously and intramuscularly, again eight hours later and again eight hours after that Further doses are seldom worth while In all cases there is always the slight risk of anaphylactic shock and the

the fact that many of the more recent chemotherapeutic agents such as Isoniazid, although synthesized in the laboratory, are also called antibiotics and many antibiotics such as Chlor amphenicol originally obtained from fungi are now synthesized in the laboratory Clearly every antibiotic is a chemothera peutic agent Nevertheless, the word antibiotic has come to stay and under this term are included all the modern chemo therapeutic agents that originated from fungi in the first instance even if they are now made in the laboratory

Penicillin is bactericidal in respect of most pathogenic cocci but, as strains of many organisms, particularly staphylococci, rapidly become resistant to it, its spectrum i e its range of activity, is not as wide as it was when it was first introduced It is also effective against the fungus which causes actinomycosis and all pathogenic spirochaetes, notably the one which causes syphilis On the whole it is a remarkably safe drug in the sense that it can be given over long periods in large doses without causing bodily harm A single dose may clear up some minor infection More often administration twice a day for several days is required, and in more severe cases very large doses must be given Some people are however, naturally sensitive to it and others become so while being given it or are found to have become sensitive to it when they are given it a second time Further, its use stimulates the growth of penicillin resistant organisms, particularly staphylococci, whence it follows that it must be used with restraint Ordinary penicillin is destroyed by gastric digestion or poorly absorbed from the gut and must be given by intramuscular injection but phenoxy methyl penicillin (penicillin V) seems to escape destruction and/or to be absorbed sufficiently It is now much used in paediatric practice to avoid intramuscular injections in children

Soon after penicillin had been introduced a number of other antibiotics were discovered which escape gastric digestion and are readily absorbed These are known as the oral antibiotics and their administration has certain dangers They all tend to sterilize i e eliminate the normal flora from the mouth and colon and may let in a pathogenic organism which happens to be insensitive to them Thus fungus infection of the mouth if an oral antibiotic is pushed too far is not uncommon and a

After that there were no developments for a long while, modern chemotherapy dating from the turn of the century when Ehrlich, after many attempts to discover the perfect chemotherapeutic agent against it (the fact that it was spirochaetal in origin now being realized), introduced Salvarsan, "606," an organic preparation of arsenic, for that purpose The use of bismuth and potassium iodide started rather later

The sulphonamides were introduced a little before the Second World War They are effective against all the pathogenic cocci and the *Bacillus coli* although certain strains are or can become resistant to them But they are useless in any other type of infection Further, the action of most of them is identical in the sense that if an organism is resistant to one, it will be resistant to all the rest So the choice of a sulphonamide depends, not so much on the organism to be eradicated but on the one likely to upset the patient least and which can be got most easily in high concentration to the part of his body affected For example, if infection is of his blood or urinary tract, a relatively soluble sulphonamide will be chosen so that it is rapidly absorbed into his blood and rapidly excreted in his urine, sulphacetamide, sulphamethazine or sulphadiazine If a high concentration is wanted in his gut, an insoluble one is given, sulphaguanidine, sulphasuxidine or phthalyl sulphathiazole But soluble sulphonamides should seldom be given for more than five days They tend to affect the white cell forming elements in the bone marrow and lead to agranulocytosis Further, they are all sparingly soluble and may crystallize in the urine, leading to dysuria, haematuria or even urinary suppression This risk can be largely obviated by seeing that the patient has plenty to drink and keeping his urine alkaline, better still by giving him a mixture of at least three sulphonamides instead of one alone

The use of the sulphonamides in clinical practice on an extensive scale was short lived, penicillin being introduced into medicine during the Second World War It is a powerful therapeutic agent as above defined but, being an extract of a fungus, instead of being made in the laboratory, like organic arsenic, the sulphonamides and many of the anti malarial drugs, it became known as an antibiotic This is unfortunate and the confusion so created has been worse confounded by

can be given safely every day for months although in a few people it seems to affect the eighth cranial nerve adversely leading to giddiness or deafness Then, if its administration is continued too long, loss of hearing may result

Two other simple substances are also antagonistic to the tubercle bacillus, namely, para amino salicylic acid and Isoni azid The former (P A S) can be given by the mouth although in some people it tends to cause anorexia and nausea The latter (I N A H), also given by the mouth, seldom leads to any side effects, although temporary mental derangement in people predisposed in that direction occurs occasionally

Some bacteria are resistant by nature to all sulphonamides and antibiotics, but most of these are fortunately saprophytic and only secondary invaders in the wake of a more virulent organism Provided the original infection is eradicated and structural order restored they usually die out Two of them however, *B proteus* and *P pyocyanaeus*, are true pathogens but as their activities are usually confined to a surface they can sometimes be eliminated by local irrigation with mild anti septics A third, the mycobacterium of leprosy, flourishes in subcutaneous tissues and along nerves but is fairly sensitive to two chemical substances, namely sulphetrone and chaul moogra oil which can be injected into the tissues

Protozoa are also generally resistant to the sulphonamides and antibiotics but fortunately once again there are chemical substances usually synthetic, to which they are more sus ceptible than the cells of the human body Quinine destroys the schizonts of all species of plasmodia causing malaria but in practice is now being replaced by mepacrine or chloroquine which have fewer side effects These drugs, however cannot be guaranteed to destroy all the gametocytes which are more sensitive to pamaquin or primaquine and which should there fore be given as well But it is dangerous to give mepacrine and pamaquin simultaneously Nor do they destroy the extra erythrocytic i e the incubating, form of the parasite which is most sensitive to proguanil or Daraprim They are therefore the best prophylactics against an attack

The entamoeba causing amoebic dysentery succumbs to emetine, one of the alkaloids of ipecacuanha very readily This is now synthesized and can be given by intramuscular injection

staphylococcal enteritis produced in this way may be fatal So they should be given in courses of not more than ten days and always stopped if the patient develops glossitis, his bowels become loose or his faeces start to lose their natural odour Further, as human health depends amongst other things on vitamin B production by bacterial action in the colon, a patient on oral antibiotics should be covered against any possible decline of "home production" by the administration of it by the mouth

These oral antibiotics, all derived from different species of streptomyces, include tetracycline and its two chemical derivatives chlortetracycline and oxytetracycline They are bacteriostatic against a much wider range of organisms than penicillin and also against some of the larger viruses, notably that of virus pneumonia Further, a staphylococcus which becomes insensitive to penicillin may remain sensitive to tetracycline (As their action is much the same and tetracycline the least irritating of them to the stomach, it is now most often given) Another antibiotic in this oral group is Chloramphenicol It is the most effective against the typhoid bacillus and Salmonella and *B abortus* infection and often more effective than tetracycline against resistant staphylococci But it must be used with caution, particularly in children, as it is liable to lead to aplastic anaemia Yet another, erythromycin, has a much narrower spectrum in respect of its action against Gram negative bacilli, but is often effective against staphylococci resistant to these wide spectrum antibiotics Spiramycin and oleandomycin both have a wider spectrum but are slightly less effective against staphylococci Further, if these organisms *do* develop resistance to them, they also tend to become resistant to erythromycin This is not true of novobiocin, however, an antibiotic of fairly wide spectrum, but which is liable to give rise to skin rashes, drug fever and leucopenia

Streptomycin, an extract of the fungus *Streptomyces griseus*, being poorly absorbed from the gut, must, like penicillin, be given by intramuscular injection It is bactericidal in respect of certain pathogenic organisms untouched by penicillin, namely, the tubercle bacillus, and the *H influenzae*, *B coli* and other organisms of the paracolon group little affected by any of the oral antibiotics On the whole it is well tolerated and

the combination of a bactericidal with an only bacterio static one

5 If the disease is local, the highest possible concentration must always be effected as quickly as possible in the centre of the infection Various surgical techniques can be used to achieve this result

6 Granulation tissue and pus both act as a barrier not only to the spread of infection, but also to the penetration of chemo-therapeutic agents into an infected area The former should be removed and the latter drained away whenever possible

In the treatment of some infections there is no doubt as to which chemotherapeutic agent to use For example Chlor amphenicol is *the* antibiotic in all cases of typhoid *B abortus* and Salmonella infection, tetracycline in all cases of virus pneumonia Indeed the only real difficulty is to know how long to continue treatment but some knowledge of the natural course of the untreated disease usually answers this question

Syphilis raises special problems Penicillin is now *the* chemo therapeutic agent in the treatment of infection by all spiro chaetes and has largely replaced organic arsenic which held the fort in the treatment of syphilis for nearly half a century To obtain the best results it must be started as soon as possible It can and must be started *at once* in all cases of primary and secondary syphilis and whenever a pregnant woman gives a positive Wassermann reaction At these stages it is curative the risks of giving it are negligible and congenital syphilis can be prevented In tertiary and quaternary syphilis it must not be started too abruptly A sudden outburst of spirochaetal activity a Herxheimer reaction, might result In the nervous system this is likely to take the form of some sudden paralytic lesion (usually of a cranial nerve) in the aorta sudden occlusion of the mouth of a coronary artery, precipitating heart failure Rather penicillin should be preceded by mercury and iodides by the mouth and intramuscular injections of bismuth at intervals of five days for about a month In general tertiary syphilis does well on it but even penicillin cannot undo permanent damage either to the central nervous system or to the aorta and the results of treatment in quaternary syphilis are less good, although better than by any other method Further, the criteria

although only in small doses Much larger ones of its poorly absorbed salt, emetine bismuth iodide, can be given by the mouth and, like the poorly absorbed sulphonamides, leads to a high concentration of the drug *in the gut* *Certain other* iodized quinoline compounds, chiniofon and diodoquin, and an arsenical, carbasone, are effective to a less extent but being less toxic can be given for longer periods The causative organism of trypanosomiasis is susceptible to certain chemical poisons such as the organic urea compounds, pentamidine, and trypars amide, and those of Leishmaniasis (kala azar) to pentavalent antimony compounds

Fungi are susceptible to antibiotics and chemotherapeutic agents to the same extent as the less pathogenic bacteria The most virulent, the *S actinomyces*, is often sensitive to penicillin and the sulphonamides as well as to streptomycin and some of the oral antibiotics *Candida albicans* being a surface invader can be treated with local antiseptics such as gentian violet Other blastomyces and higher fungi, such as the aspergilla, which penetrate the body more deeply, are variable in their response to chemotherapeutic agents but many seem to be susceptible to iodides

So in the treatment of some infections we now possess an almost embarrassing number of remedies Certain general principles hold, however, in regard to the use of all of them—

1 All antibiotics and chemotherapeutic agents must be given in the highest possible dose devoid of risk This demands some knowledge of their action and toxicity
2 They should be administered before the reactions by the body, which prevent *the organism spreading, start to* prevent them reaching the organisms This demands early diagnosis
3 They must be given for a sufficient length of time to allow the body's natural immunity reactions to be mobilized This *requires some knowledge of the average natural course of the* disease for which the patient is being treated
4 No single antibiotic must be given for too long if the infective organisms are known to be able to develop resistance to it Under these circumstances, whenever possible, two chemo *therapeutic* agents should be given simultaneously, avoiding

effected by the operation of thoracoplasty is often worth while Finally, the excision of a tuberculous focus which does not respond to systemic chemotherapy should always be considered and with chemotherapy to back it, surgery can be more radical than in pre chemotherapeutic days

In acute pyelitis of pregnancy (nearly always due to *B coli* infection) symptoms usually remit as soon as the urine has been rendered alkaline with potassium citrate But it is doubtful if the urinary tract can really be sterilized of *B coli* by this method although it often returns to its normal sterility after birth of the child In these days sulphonamides, to which most strains of *B coli* are sensitive, are usually given as well If however the patient s symptoms do not remit, and in all cases of pyelitis and cystitis complicating such conditions as stones, prostatic obstruction and new growth, the pathogen must be isolated and tested against all the antibiotics likely to prove effective against it because resistance is very common Most *B coli* insensitive to sulphonamides prove sensitive to streptomycin and *Strep faecalis* to tetracyclines Then one of these or some combination of them must be given

Purulent meningitis presents a special problem for two reasons The antibiotics with their large molecules do not penetrate readily into the cerebro spinal fluid and only penicillin and streptomycin can be given intrathecally In every case the offending organism must be isolated from the spinal fluid quickly If it proves to be the meningococcus or a pneumococcus, penicillin is given intrathecally and intramuscularly and a sulphonamide by mouth If it proves to be the *H influenzae* streptomycin is given intrathecally and intramuscularly and penicillin intramuscularly or some other antibiotic by mouth If it proves to be a staphylococcus, streptomycin is again given intrathecally and some other antibiotic, such as tetracycline or Chloramphenicol to which it is found to be sensitive

Even infections of the throat raise difficult problems Most cases particularly ordinary streptococcal throat in adults recover naturally and are seldom sufficiently severe to justify antibiotics On the other hand their use has reduced the incidence of otitis media and mastoid disease in children enormously So every case must be judged on its merits,

of cure (alteration in the titre of the W R in blood and the W R and colloidal gold reactions in the cerebro spinal fluid) are unsatisfactory, but two courses of penicillin, each of twenty-one days, at an interval of three months are generally considered sufficient

The treatment of tuberculosis is still more difficult Not only have we now three chemotherapeutic agents at our disposal but surgery can be called in to help and cortisone used to prevent the formation of adhesions which may militate against drugs getting to the part of the body particularly affected

In acute or subacute pulmonary tuberculosis and in tuberculous pleurisy and peritonitis two of the available chemotherapeutic drugs must be used simultaneously for the reasons already stated The usual combination is streptomycin and para amino salicylic acid, keeping Isoniazid in reserve and substituting it for streptomycin if the patient proves intolerant of streptomycin Tuberculous meningitis presents a somewhat different problem There is no time to be lost if permanent damage to the nervous system is to be avoided, indeed if life is to be saved Further, para amino-salicylic acid is not effective enough and Isoniazid and streptomycin must be given The trouble is that the latter does not pass readily into the cerebro spinal fluid (on account of its large molecule) and must often be given intrathecally where it tends to stimulate an inflammatory reaction which may lead to meningeal adhesions So its intrathecal administration must sometimes be combined with that of cortisone Further, in all cases of acute tuberculosis chemotherapeutic drugs must be continued for a very long time, although on a diminishing scale, to consolidate recovery Nor must the importance of rest and good food, and later fresh air, ever be forgotten

In chronic cases it becomes increasingly difficult to get chemotherapeutic drugs to the part of the body affected and surgery is often necessary in order to gain access to it For example, streptomycin must be injected into the pleural cavity in a case of tuberculous empyema and a tuberculous abscess or sinus opened up and streptomycin left in it Surgery may also be useful with other intent If there are patches of the disease throughout a lung, temporary relaxation of it effected by inducing an artificial pneumothorax or permanent collapse

helping him over the stiles of life and discouraging him from taking up some too exacting profession In short where a schizophrenic tendency exists, prophylactic psychotherapy is well worth while, there being all degrees of this strange predisposition

When the patient actually breaks down, he must be got quickly under supervision and restraint An attempt should be made to persuade him to enter a mental hospital as a voluntary patient If this fails he must be certified and his body maintained while his mind is ill He must be deliberately fed, protected from doing himself harm, all means of suicide put out of his reach and, if violent, restless or sleepless be given sedatives sufficient to control him

Until recently insulin shock therapy i e repeatedly rendering a patient hypoglycaemic to the point of unconsciousness for an hour or more at intervals of a few days was believed to shorten an acute schizophrenic attack and improve the prognosis of a chronic case Psychiatric opinion is however, rapidly swinging in the direction of regarding this treatment as serving no useful purpose Nevertheless, although schizophrenia is an incurable disease, in the sense that we have no radical treatment for it yet, much has been done of recent years to improve the lot of these patients Modern long term sedative drugs, notably chlorpromazine and the barbiturates, are used in the acute attack Physical restraint and seclusion is avoided as much as possible and they are no longer treated as outcasts, kept behind locked doors or handled in a spirit destitute of hope Rather, they are helped to live with themselves and their fellows and with other patients in the mental hospital, group formation to help each other being encouraged The result of this new approach has been that although schizophrenia remains common a much larger proportion of cases admitted to mental hospitals in an acute attack recover sufficiently to be discharged and are able to live reasonable social lives in their own homes among their own people Nevertheless, some cases go steadily downhill They become melancholic manic katatonic, stuporose, violent or in some other way unmanageable, sometimes beset and their conduct ordered by some strange delusion and it is in these cases that prefrontal leucotomy is sometimes performed. For it abolishes the patient s emotional

remembering that even penicillin by the mouth may lead to penicillin sensitivity and that an oral antibiotic predisposes to gastro enteritis In a severe sore throat in a child, particularly if associated with ear ache, there is no doubt about the wisdom of giving antibiotics but Chloramphenicol and sulphonamides, on account of the bone marrow risks, are to be avoided Penicillin should be tried first, if it fails, tetracycline

Acute bronchopneumonic infection demands chemotherapy at any age but wherever possible the pathogenic organism and its sensitivity to antibiotics should be ascertained first When no sputum can be obtained, it is necessary, except in a very mild case, to start chemotherapy "in the dark" Sulphonamides are now seldom used alone and it is usual to begin with oral penicillin in children, and intramuscular penicillin coupled with streptomycin twice a day in adults If the patient's symptoms show no signs of remission after a few days and the responsible organism is now found he must be switched to the appropriate antibiotic, if it cannot be found to tetracycline and then Chloramphenicol and then possibly novobiocin, in that order In this country it is the generally accepted policy to reserve erythromycin for strains of staphylococci resistant to all other antibiotics

MAKING THE BEST OF THE LITTLE UNDERSTOOD

When the cause of a disease is not known, it is difficult to prevent it, but when it actually occurs, it does not follow that nothing can be done about it True that disease of this kind cannot be cured in the sense that the body ever becomes normal again but its progress can often be arrested, the risks to which it exposes the individual reduced, and structural defect remedied sufficiently or functional disorder kept under control to such an extent that his life can be often prolonged Indeed, empirical treatment of a disease, the cause of which we have not as yet the faintest idea, may enable the man once seriously ill to live out his full span of human existence

Psychotic Breakdown

If a schizophrenic tendency can be spotted in an adolescent much can be done to prevent actual mental breakdown by

one or both sides of the family from having children but, as has been seen already (page 303), the chances of a woman giving birth to a potentially epileptic child are much too small to warrant a doctor taking too strong a line in this matter So epilepsy is likely to remain endemic in the human race All that can be done is to control it as far as possible whenever it turns up

The patient should lead a normal life merely avoiding occupations in which an attack might be dangerous to himself or others (He will not be granted a licence to drive a motor vehicle) As a disease it is incurable but his tendency to fits can usually be controlled by means of drugs Phenobarbitone should be tried first and usually proves successful in reducing the number of attacks although it can never be guaranteed even when one has not occurred for a long time, that another will never suddenly occur If phenobarbitone fails methyl pheno barbitone, primidone or phenytoin should be tried but the latter may lead to toxic side effects notably swelling of the gums and rashes on the skin Troxidone is useful in the treatment of petit mal but may give rise to agranulocytosis So the white count must be watched In status epilepticus the fits must be controlled by getting the patient under an anaesthetic Paraldehyde by intramuscular or intravenous injection is probably the safest

The epileptic patient should be encouraged to live sensibly with his fits, and his family and mates at work told what to do (and not to panic) when he gets one the disease, controlled with drugs, being often compatible with a long span of almost normal human existence Some become more and more difficult and impulsive, however, or their minds deteriorate progressively Or their fits become so frequent that for this or other reasons they must be admitted to an epileptic colony where they can work their wants are provided for and they live under constant supervision

Failure of Carbohydrate Metabolism

The principle in the treatment of diabetes is to put the patient on a normal diet adequate for his age, weight and work, find out by trial how much insulin he requires to meta bolize the carbohydrate, protein and fat in it and then keep him permanently on it

reaction to his delusion which, although still there, now ceases to worry him with the result that he becomes a socially manageable person But it is not without risk Sometimes motor tracts are damaged and in some cases it leads to further deterioration in personality

Endogenous depression in a mild form is common and most patients get through their attacks unaided although it is responsible for most of the suicides reported in the press Sleeplessness in the early morning demands the long acting barbiturates, but in giving them the doctor puts the means of suicide into his patient s hands and every severe case must be admitted to hospital Whether the borderline case should be admitted is always a difficult and responsible decision Often it is not really necessary but in view of the dangerous nature of the condition it is wise to err always on the side of safety Amphetamine in the morning to counter his depression and barbiturate at night to help him sleep, backed up by the cheerful atmosphere of the ward, which helps to get him out of himself, and occupational therapy, to distract his mind, may now suffice He gradually emerges from the tunnel of loss of hope through which he has been passing The more severe cases and those in which natural recovery is delayed demand electrical convulsion' therapy, the epileptiform convulsions (and their attendant risks of fractures particularly in elderly people) which would ensue being prevented by the prior administration of a light anaesthetic and curarine while artificial respiration is maintained This treatment often appears to cut short what would in all probability otherwise be a long and dangerous illness, about six convulsions usually being given at intervals of about a week On the other hand, it must not be prescribed too readily and is certainly contra indicated in cases associated with any neurotic tendency For a person can get addicted to it in the sense that he comes to rely on E C T just as he can get addicted to and come to rely on morphine or cocaine E C T is also valuable in the treatment of the involutional melancholia of advancing age

Idiopathic Epilepsy

There is no known method of preventing idiopathic epilepsy short of discouraging married people with a history of fits on

urine, he is in danger of lapsing into coma at any moment Stabilization is now unimportant What must be done, and done quickly, is to effect oxidation of carbohydrate in his body at sufficient speed to burn up the ketone bodies which have accumulated as the result of the incomplete combustion of fat and protein He should be given glucose and insulin simultaneously, 40 G of the former by mouth and 20 units of the latter by injection, every three hours until he is out of danger from ketosis, i e until Gerhardt s test on his urine is negative Only then can his insulin requirement in relation to the diet that his age, weight and work demand be safely ascertained by the method that has already been described

When a patient is actually in coma he should be given at least 80 units of insulin immediately and rushed to hospital Dehydration and salt depletion dominate the clinical scene and must be countered immediately by fixing up an intravenous drip with as much speed as possible and running in normal saline followed by four per cent glucose in one fifth normal saline (to relieve his depleted glycogen reserve) at such a speed as to restore his fluid and salt balance in eight to twelve hours In some cases potassium is urgently needed as well as sodium (page 400) Insulin is added to the drip every half hour in doses of 80 units (It is difficult to give too much insulin the *common fault being not to give enough and not to counter* dehydration strenuously enough) Rapid action on these lines will save most lives Then as the depth of his coma lessens and hyperglycaemia and glycosuria remit his dose of insulin is reduced and, as soon as he recovers consciousness glucose and insulin are given as in the treatment of pre coma until ketosis has been eliminated The intravenous drip should be kept up until plasma analysis reveals that the electrolyte equilibrium of the body has been restored

When a patient s requirement in respect of soluble (rapidly acting) insulin given in three doses has been ascertained an attempt must be made in order to obviate so many injections to switch to one injection before breakfast consisting of a mixture of soluble quick acting and relatively insoluble long acting insulin which on account of conjugation with protein or zinc is absorbed more slowly from the point of injection In theory the total amount of insulin required is still the same In

When the patient is overweight the degree of diabetes from which he is suffering is usually slight He should be put on a 2,000 Calorie diet or if much overweight, on a low calorie diet, say 1 200 On this regime he will lose weight and sugar disappears from his urine So insulin may prove unnecessary (A large number of obese people succeed in coping metabolic ally with the food they require to maintain their weight and do their work but cannot cope with the excess that they eat merely because they like it) By this method many diabetic complications notably arteriosclerotic gangrene, can probably be prevented

When a patient's diabetic state is more severe but his metabolism of fat has not yet started to fail (as revealed by negative Gerhardt and Rothera tests) he can be safely put on the correct calorie diet for his age, weight and work and insulin started immediately The dose must be guessed in the first instance, but few patients require less than 20 units three times a day (given twenty minutes before meals) and some want up to 40 60 or even as much as 80 or 100 units (A very high insulin requirement suggests sepsis somewhere or active tuberculosis of the lungs and these must be excluded) If sugar persists in his urine after a few days, either his dose of insulin must be stepped up or his diet cut down, which is done depend ing on his weight and work When, whichever course is adopted, sugar eventually disappears from his urine, his dose should be reduced by about twenty per cent (leaving his diet unchanged) to obviate any risk of a sudden hypoglycaemic attack Sugar will now reappear in his urine in small quantities but this does not matter provided that he is metabolizing enough of his diet to maintain his weight (A diabetic must be treated to his weight and not to the sugar in his urine) Further, a little sugar there is an insurance policy against hypoglycaemic attacks Nevertheless too much sugar in the urine must be avoided It means some degree of hyperglycaemia except when the renal threshold is low (it is raised in most chronic diabetics) and patients with hyperglycaemia never feel really well Further, there is evidence that hyperglycaemia predisposes to arterio sclerosis in elderly subjects

When a diabetic is ketotic as judged by the smell of acetone in his breath and positive Rothera and Gerhardt tests on his

usually given, occasionally iron and ammonium citrate in solution When this method does not work, or speed is essential absorption from the gut can be short circuited by parenteral administration Intramuscular injections of organic iron, some times painful, should be tried first Intravenous iron is painless and acts more quickly but may stimulate pyrexial reactions and even cause convulsions So when a patient is severely anaemic on account of iron deficiency, and particularly if speed in restoring his blood to normal is important it may be well to break the vicious circle of his anaemia by starting treatment with a blood transfusion

When the patient is suffering from hyperchromic macrocytic anaemia due to absence of the intrinsic factor from his gastric juice, that is to say he is suffering from pernicious anaemia cyanocobalamin (vitamin B_{12}), the essential missing substance must be given One injection every day or every other day will quickly get his blood normal again and then a similar injection once a fortnight or month will keep it normal But he must continue his injections indefinitely because although he can live symptom free, he has not been cured in the strict sense of the word Further, during periods of ill health his dose of cyanocobalamin must sometimes be increased and it is well to remember that it is the chronically under treated cases that develop subacute combined degeneration of the spinal cord

When hyperchromic anaemia occurs in spite of free hydro chloric acid in the gastric juice, it must be due to malabsorp tion or deficiency of some other haemopoietic factor as in idiopathic steatorrhoea tropical sprue and the megaloblastic anaemias of pregnancy In these conditions folic acid seems to work as well as cyanocobalamin and in steatorrhoea and sprue also leads to improvement in the patient s gastro intestinal state as well as in his blood count Given by mouth it does not always prove effective, however as it may not be absorbed Under these circumstances giving it by injection should be tried

When anaemia is due to failure of blood corpuscle formation *and* haemoglobin production, i e when it is aplastic in type, the only treatment is blood transfusion Nevertheless, now that this is so easy (until the veins get difficult) it is the right course of action provided the patient is sufficiently stable in his outlook on life to stand it Many who would otherwise have died in a

practice it is wiser in respect of the long acting insulin to start rather lower in order to obviate any risk of a hypoglycaemic attack round about tea time and work the dose up gradually Many cases of diabetes can often be treated with one injection of long acting insulin

Certain essential facts must be impressed on every patient before he can be safely sent off on his own He must stick to his diet, but it is rarely necessary for him to weigh and measure it Most people eat very nearly the same quantity at each meal and the diabetic diet necessitates very slight adjustment of previous habit He must inject himself with insulin regularly and must be warned that he is bound to get a hypoglycaemic attack if he takes his insulin and does not eat his normal meal after it (He should always carry a few lumps of sugar in his pocket in case he feels an attack coming on) If he "goes off his food he must take the carbohydrate equivalent of his diet, which he should be told (an amount of glucose equivalent in calories to all the carbohydrate, seventy five per cent of the protein and ten per cent of the fat), as sweet drinks and continue his insulin Local sepsis, e g a boil, or an infection, e g influenza, is bound to increase his insulin requirement So he should never hesitate to seek medical advice if ill

Sometimes the normal routine of the diabetic life must be interrupted A diabetic woman is about to have a baby or a diabetic patient is suddenly taken seriously ill and must undergo a serious operation Under these circumstances the therapeutic answer to the problem is to put the patient on a glucose insulin mixture, i e on the carbohydrate equivalent of his diet and continue his insulin Then nothing disastrous *diabetic can possibly happen On the one hand,* he is getting too much glucose to lapse into hypoglycaemic coma, on the other too much insulin to develop hyperglycaemic diabetic coma

The Primary Anaemias

When anaemia of the hypochromic microcytic type is due to unexplained failure to absorb iron (it may also be due to haemorrhage, myxoedema or vitamin C deficiency) it can often be 'cured' by maintaining a high concentration of iron in the gut Ferrous sulphate or gluconate in *tablet form* is

usually given, occasionally iron and ammonium citrate in solution When this method does not work, or speed is essential absorption from the gut can be short circuited by parenteral administration Intramuscular injections of organic iron some times painful, should be tried first Intravenous iron is painless and acts more quickly but may stimulate pyrexial reactions and even cause convulsions So when a patient is severely anaemic on account of iron deficiency, and particularly if speed in restoring his blood to normal is important, it may be well to break the vicious circle of his anaemia by starting treatment with a blood transfusion

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few months have been kept in reasonable health for years by means of quarterly or still more frequent transfusions

Constitutional Obesity

In theory the treatment of constitutional obesity is to reduce the patient s calorie intake or make him take more exercise In practice the former is the only practical method of proceeding as he is too fat for much exercise and invariably of the tempera ment that dislikes it So the treatment of obesity boils down to putting the patient on a low calorie but relatively high protein diet, the former to compel him to live on his own stores of fat, the latter, through the specific dynamic action of protein, to raise his basal metabolic rate The difficulty lies in disciplining him to eat less, particularly much less carbohydrate Neverthe less, it can and must be done and in some cases it is worth while putting him on dextro amphetamine which reduces appetite But it is useless to rely on it alone It must always be combined with radical restriction of diet Further, it is dangerous to give thyroid extract True that it will reduce weight but it may have an adverse effect on the myocardium of the fat person and lead to palpitation, tachycardia and even to auricular fibrillation

Stone Formation

Gall stones are associated with obesity, a tendency to which should always be taken in hand as soon as possible, renal calculi with congenital disorders of metabolism (which cannot be cured), infection of the urinary tract, which must be kept sterile if possible, and a concentrated urine rendering it advisable to drink plenty in hot countries In practice the question of the prevention of stones seldom arises except when people are confined to bed Rather, the patient presents with a stone as a clinical *fait accompli*

Gall stones seldom lead to serious complications and they are not worth removing, cholecystectomy being a difficult operation, unless they start to cause trouble The difficulty is to decide how much trouble they must cause to justify the risks involved In general, when they start to cause biliary colic or lead to more than one attack of cholecystitis they ought to be taken out and the gall bladder with them Leaving the latter

behind asks ' *for more stones to form in it and cholecystectomy* interferes much less than might have been expected with the digestion of fat So the gall bladder is only drained and left behind if its removal is too difficult

There is never any doubt as to what to do in general about renal calculi They must always be removed if possible, sparing renal substance as much as that can be done After an attack of renal colic a *stone stuck in a ureter* usually at the *ureto vesical* junction, will often pass naturally, if an analgesic and anti spasmodic like pethidine, is given Stones in a renal pelvis or in the kidney itself demand surgical intervention because they grow destroying renal substance and predisposing to infection When calculi are bilateral the efficiency of both kidneys must be determined and then provided the worst kidney is judged competent of clearing the body of urea over the period of the operation the least damaged kidney is tackled first and the one more severely damaged later Calculus anuria that is to say, suppression of urine due to stones stuck in both ureters creates a surgical emergency (page 331)

High Blood Pressure

When a patient is discovered to have symptomless chronic benign hypertension it is probably wise to say nothing about it because he may only start worrying and begin to suffer from functional headaches in consequence True that this condition may lead to heart failure, cerebral haemorrhage or cardiac infarction at any moment but individual prognosis is quite impossible to assess and it is often compatible with many years of normal life So it is always justifiable to be optimistic Nor is any radical alteration in the patient s life indicated Modification of diet a lower consumption of fat and more exercise even if they would have prevented it and reduced the risk of cardiac infarction are too late to accomplish anything now Obesity, on the other hand, is always worth treating but with reduction in his weight there is no guarantee that the patient s blood pressure will fall

If a patient has been told that his blood pressure is high the position is rather different Some show of treatment may be indicated, particularly if he is worried but repeatedly taking his blood pressure should still be avoided It serves no useful

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purpose Rather, unless deliberate lies are told, it is only likely to create unnecessary alarm and despondency What is much more important is to get him to adopt a right attitude to his blood pressure and how to do this has already been discussed (page 309)

When, however, a patient s blood pressure is rising rapidly leading to symptoms (malignant hypertension), the hypotensive drugs which act by blocking the passage of nerve impulses at preganglionic junctions, thereby reducing arteriolar tone of vaso motor origin must be given (Their action is comparable to sympathectomy an operation now seldom performed for hypertension) But they must be used cautiously, when the demand for hypertension is leading to left heart failure, as they may affect the coronary circulation adversely (page 326) and under these circumstances precipitate severe failure They are contra indicated in cases of renal failure in which hyper tension has been turned on to maintain glomerular filtration (In a case of chronic nephritis with high blood pressure hypo tensive drugs may precipitate uraemia) But they will relieve hypertensive headaches, save failing sight due to papilloedema or retinal exudates and often prolong life Nevertheless, treat ment with them is symptomatic only The unknown cause of the disease persists and, once started, they must be continued indefinitely

They usually work sufficiently well given by mouth but must occasionally be given by injection and then the patient must not get up suddenly after one Doing that might pre cipitate acute postural hypotension and fatal syncope So the oral route is preferable, their dose being controlled by repeated blood pressure readings and the necessity of having the right blood pressure being explained to the patient in order to get his mental outlook to his disease right In acute hyper tensive encephalopathy, i e the syndrome of rapidly rising blood pressure violent headache, vomiting and epileptiform convulsions with loss of consciousness (and sometimes ambly opia), steps must be taken to reduce intracranial pressure immediately The safest method of doing it is by venesection, which sometimes works almost miraculously, restoring sight and consciousness An alternative procedure is lumbar puncture,

the spinal fluid being let out very slowly Sedatives will be given and hypotensive drugs started gradually *

Contrary to what might have been supposed, the hypo tensive drugs have proved of little value in pre eclamptic toxaemia In this condition the patient must be put to bed on a restricted salt and protein diet Then if her blood pressure does not come down, labour must be induced as soon as her child is viable She should not have another baby and all women with persistent high blood pressure, with or without chronic renal disease, must be warned against the risks associ ated with becoming pregnant

The Hypersensitivity Diseases

These are probably due, as has been seen to the body reacting either abnormally to some antigen with which it has come into contact or to some abnormal antigen produced within it Nevertheless, their duration is often naturally self limited A patient may recover completely for example from an attack of acute specific rheumatism anaphylactoid purpura erythema nodosum, thrombocytopenic purpura or infective polyneuritis without any specific treatment (In these cases it is common to obtain a history of some preceding episode of infection often of the respiratory tract suggesting that the body first suc cumbed but later adapted itself to the underlying cause of the disease) Whence it follows that certain general principles hold in the treatment of all of them First and foremost the patient must be given an adequate period of complete rest in bed to facilitate natural recovery of which there is always a chance Secondly, any external source of antigen should be eliminated if it can be found *and it is possible to do it* Thirdly, and particularly if this cannot be done suppressing the abnormal reaction of the body by means of steroid therapy should be considered Fourthly the long term structural and functional consequences of the disease must be offset as far as possible when this becomes necessary Finally any drug which has been found to work empirically should be exhibited without any scientific hesitation

Acute specific rheumatism presents the most common

* New drugs of this kind are coming on the market so fast that no useful purpose would be served by ment oning them by name

problem of this kind Many cases of it, particularly those in later age groups, undoubtedly recover spontaneously without any permanent damage to the heart having been done A long period of complete rest in bed is, however, necessary to achieve this result, particularly in young children, and it is well known that premature physical exertion is very apt to precipitate relapse of the disease process All cases should also be put on as large doses of sodium salicylate or acetylsalicylic acid as the patient can tolerate How they work is not understood but they certainly relieve the pain of the disease specifically, quickly reduce any swelling of the joints and restore the erythrocyte sedimentation rate to normal Whether they actually reduce the chances of the patient ultimately developing valvular disease of his heart is still undecided Probably they do not and it is often unwise to rely on the salicylates alone If there is a history of sore throat preceding the attack, and certainly if haemolytic streptococci can be isolated from it, a course of penicillin or, if need be, of one of the oral antibiotics should be given to eliminate this probable antigen Further, under these circumstances and particularly after a relapse chronically infected tonsils should be removed as soon as it is considered surgically safe and even apart from chronic tonsillitis statistics show that routine administration of sulphonamides reduces the incidence of rheumatic relapses They should therefore usually be given

Whether a patient with acute rheumatism should be put on *steroid therapy* is a still more difficult question Undoubtedly it will cut short an attack, even better than the salicylates, but how long it must be continued to prevent, indeed if it ever does prevent, the development of valvular lesions is again at present undecided The trouble is that when a patient who has had acute rheumatism at ten develops mitral stenosis at twenty it is impossible to find out whether this is merely due to fibrous tissue contracting or due to persistence down the years of an active hypersensitivity disease process which the continued administration of cortisone *might* have prevented Be this as it may, at this late stage valvotomy will often relieve breathlessness in pure stenosis and digitalis and diuretics do much to postpone the onset of congestive cardiac failure (page 327)

In anaphylactoid purpura and erythema *nodosum* rest in

bed is also advisable, although it need not be for so long as in acute rheumatism and a streptococcal throat associated with them will be treated on the same lines Erythema nodosum can, however, be due to hypersensitivity to the tubercle bacillus So when an active focus of tuberculosis is found the patient must be given a full course of streptomycin and P A S or I N A H In thrombocytopenic purpura and acquired haemolytic anaemia no evidence of any active causative antigen is likely to be discovered and it is usually necessary, unless spontaneous remission occurs quickly (always most unlikely) to put the patient on cortisone to inhibit the abnormal reactions of his body responsible for the haemorrhage and haemolysis respectively Later, if one of these conditions still does not remit, splenectomy as an alternative to the prolonged administration of cortisone must be considered Neither is an active antigen likely to be forthcoming in polyneuritis or encephalitis also probably hypersensitivity diseases So again cortisone should often be tried pending spontaneous remission while nerve palsies and respiratory paralysis are countered by such mechanical means as their nature and extent necessitate

When the whole body seems to be affected by some hypersensitivity process as in polyarteritis nodosa disseminated lupus erythematosis and dermato myositis no active causative antigen can usually be incriminated but in sarcoidosis the chances of it being a hypersensitivity reaction to tuberculous infection are sufficiently high to warrant a course of anti tuberculous chemotherapy In the others cortisone may be required to maintain life, in all including sarcoidosis to reduce the damage being done and give the patient more time in which to recover naturally But steroid therapy is a double edged weapon Very large doses are often required to control symptoms and the more prolonged this treatment the more likely is the body to lose its natural resistance to infection Steroid must therefore sometimes be combined with prophylactic chemotherapy Further, the patient may develop signs of hypercorticalism, namely moon face, retention of salt and water leading to oedema and increase in weight hypertension and osteoporosis on the dose necessary to keep his hypersensitivity symptoms under control

For these reasons steroids are always to be avoided in the

very chronic hypersensitivity diseases In rheumatoid arthritis, for example, an initial period of rest in bed, particularly if the patient is febrile, is essential During it he should be fed well above his normal calorie requirement, particularly if he has lost weight, and any tendency to anaemia countered by giving iron and, if necessary by small blood transfusions Pain can usually be relieved by the ordinary analgesic drugs Those of addiction must always be avoided, but phenylbutazone may prove more efficacious than phenacetin, acetylsalicylic acid or even codeine The range of movement of the joints affected should be maintained as far as possible by gentle passive manipulation and the nutrition of the wasted muscles round them by massage Active steps must also be taken to prevent the limbs being drawn up into mechanically inefficient positions, flexion of the knee and plantar flexion of the foot pronation of the wrist and flexion of the fingers, by splints or plasters These must always be worn at night In acute cases steroid therapy must be tried Although in no sense curative, it will sometimes relieve pain and enable the physiotherapist to 'get at" the patient much sooner and work on him much harder with the result that the final degree of disability left over when at long last the disease has 'burnt itself out is much reduced In the more chronic case the local injection of cortisone into a joint is often well worth while

Ankylosing spondylitis must be treated on similar lines but the arthritis of it reacts to deep X ray treatment which ordinary rheumatoid joints do not The incidence of leukaemia in cases treated in this way is now known to be significantly greater than among the general population This risk must however, often be taken although treatment should probably be limited to a single course

Peptic Ulcer

When a duodenum becomes inflamed leading to a subacute or chronic ulcer the patient must be taught to live in such a way as to promote healing and prevent any further extension of this potentially dangerous condition He must stop smoking (Most patients with duodenal ulcer are sensitive, in respect of their gastric secretion, to tobacco) Further, he must take steps to keep down the level of his gastric acidity (For, although this is

not the cause of simple ulceration, it is a certain factor in preventing natural healing) There are two ways of doing this eating food and taking alkaline powders He should have small meals often (rather than large ones occasionally), eating good plain well cooked food There is no necessity to diet and it is a mistake to put him on milk Indeed, the gut does not like milk Rather, eating meat, contrary to what was taught at one time, should be actively encouraged, better, too, a dry diet than one of slops Between meals he should take an alkaline powder regularly and it is important to find one for example the right mixture of calcium and magnesium carbonates (the *former constipating and the latter relaxing*), *which he can take* indefinitely without upsetting his bowels Then having got into this regime he must keep it up more or less indefinitely It is no great hardship and it is particularly important to warn him that when his symptoms remit under this treatment, as they will in a week or so he must not default on it If he does his symptoms will almost certainly return probably with an extension of his ulcer in a few months time Persistence rather than intensity is the watchword in the treatment of duodenal ulcer

If the patient will not modify his life on these lines there is always the risk that *his ulcer may perforate* When the history of previous indigestion is then short or there was no previous pain, both indicating a very acute ulcer, and the patient is seen shortly after perforation actually occurred some surgeons keep the stomach empty by suction and leave the ulcer to seal itself off If this policy is adopted, and only the experienced surgeon should adopt it the patient must be very carefully watched For, if he begins to get peritonitis and in all cases of perforation with long histories of indigestion and in those seen some time after perforation actually occurred the abdomen must be opened, the ulcer sutured (peritoneum being stitched over it if necessary), debris removed and the peritoneal cavity sucked dry If considered necessary, a drain is inserted into it or into any pocket of infection and the patient put up in Fowler s position When a large gastric ulcer perforates (a relatively rare event) partial gastrectomy may be necessary at once, removing the ulcer bearing part of the stomach and anastomosing the remnant left behind into the duodenum

Much more commonly the neglected or unsuspected duodenal ulcer bleeds Under these circumstances the patient must be admitted to hospital at once, and if he has bled seriously or is bleeding still, blood transfusion should be instituted without delay The colour of his face, his blood pressure, his pulse rate and the amount of blood (if any) he vomited must all be taken into account in making *this difficult assessment Nevertheless,* to start transfusion is always a fault on the right side, although after a few hours bleeding usually stops naturally If how ever, he continues bleeding for more than, say, twenty four hours as indicated by his rising pulse rate, his falling blood pressure and the increasing pallor of his face and mucous membranes (haemoglobin estimations, as already pointed out, are unreliable as an indication of anaemia in acute haemor rhage) or having stopped bleeding he starts to bleed again, the risk of surgical intervention must be taken True that the bleeding point cannot actually be reached and excised as in the stomach but the duodenum can be occluded and converted into a blind cul de sac in which bleeding soon stops naturally At one time the stomach was simply anastomosed to the jejunum (gastro jejunostomy) but it was soon found that ulceration then occurred so frequently in the jejunum (anastomotic or jejunal ulcer) which unlike the duodenum is quite accustomed to the gastric juice, that the stomach is now always cut down by about two thirds in order to reduce gastric secretion (partial gastrec tomy) before this is done

Sometimes a duodenal ulcer will not heal or the patient cannot be persuaded to organize his life on the right lines He continues to suffer from pain after his meals or his ulcer bleeds occasionally rendering him chronically anaemic Or oedema and spasm lead to intermittent attacks of pyloric obstruction with vomiting and loss of weight Or the pylorus may begin to become permanently obstructed by fibrosis Under these circum stances the only solution of the problem is partial gastrectomy as above described Most patients do well *on it, although a few* suffer from the dumping syndrome (page 29) and a small proportion develop an anastomotic ulcer The former can be countered by eating slowly and in small quantities at a time The latter is difficult to treat medically and, if it does not respond to rest and alkaline powders fairly quickly a second

operation may be necessary removing still more of the stomach and putting the still smaller gastric remnant into the jejunum still lower down If this does not work vagotomy, to reduce gastric secretion and motility, is sometimes tried but in most cases it is necessary to perform a complete gastrectomy and oesophago jejunostomy and put the patient on cyanocobalamin It is a serious operation but most patients do surprisingly well after it

A gastric ulcer is a potentially more dangerous condition True that it seldom perforates but the risk from bleeding is much greater than in bleeding from a duodenal ulcer Not that gastric ulcers bleed more easily but because as they occur in a later age group bleeding in them is much less likely to stop naturally Indeed, no patient should be allowed to enter the fifth or sixth decade of life with an unhealed gastric ulcer So if after six months of medical treatment a gastric ulcer shows little signs of healing partial gastrectomy should be considered particularly when the ulcer is on the middle third of the lesser curvature For then the ulcer can be removed with two thirds of the stomach and the gastric remnant sutured, not this time into the jejunum but more normally on to the duodenum When the ulcer is lower the remnant must be put into the jejunum as in the surgical treatment of a duodenal ulcer When it is high partial gastrectomy (total gastrectomy is always to be avoided) must leave the ulcer behind which although this operation reduces the risk of haemorrhage is never quite so satisfactory

Regional Ileitis and Ulcerative Colitis

There is no treatment yet for regional ileitis other than excision, and as the disease almost always recurs, the usual practice is to leave it alone until it begins to cause obstructive symptoms (Many remain undiagnosed until this happens) Then as much of the gut must be resected as is necessary to restore mechanical order the operation actually performed depending on the site and extent of the disease When the small gut is alone involved, a length or several lengths are resected and that left behind joined by end to end anastomosis When the ileo caecal valve, caecum and proximal colon are involved, hemi colectomy and an ileo colostomy are necessary in addition to removing any diseased ileum

Ulcerative colitis which is always diagnosed much sooner, is treated medically at first The patient is put to bed and, particularly if he has lost weight, fed well above his calorie requirement on a high protein, low residue diet His diarrhoea must be controlled as far as possible Kaolin, bismuth and agar will be tried first (page 330) but opium and even morphine must be risked in a really acute case as the only means of securing that rest of body and mind of which he sometimes stands so desperately in need A course of sulphonamides should be given to counter secondary infection but all forms of rectal medication are best avoided Anaemia such a prominent feature of the disease partly due to loss of blood and partly due to deficient haemoglobin formation (particularly in febrile cases) can usually only be controlled by blood transfusion On this treatment a few recover completely but most relapse sooner or later Others become chronic and it is these chronic cases that perforate (behind a stricture) or develop carcinoma A few go steadily downhill

Surgical intervention must never be delayed too long In the relatively uncommon right sided cases (which link up clinico pathologically with regional ileitis) the lower colon may be sufficiently healthy to permit putting the lower end of the ileum into it after removing as much of the proximal colon as is necessary, i e the surgeon performs the operation of right hemi colectomy and ileo colostomy More often the lower colon is diseased down to the rectum rendering any operation on these lines quite impossible Then the ileum must be brought to the surface in the right iliac fossa (ileostomy) and the whole colon removed as far down as its junction with the rectum (colectomy) It is a considerable operation and the patient must not be allowed to slide too far downhill before the decision to do it is taken Rarely is it advisable to anastomose the ileum to the rectal stump even at a second operation later Rather, the rectum, which remains a source both of discomfort and danger, should be removed, after the patient has regained strength, for three reasons Firstly infection persists in it, leading to a rectal discharge Secondly, it may bleed seriously Thirdly, the chances of carcinoma developing in it are abnormally high So of necessity the surgical treatment of ulcerative colitis, so often essential to save life condemns the patient to a permanent

ileostomy, an operation which must be explained to him before it is performed But it interferes with normal life much less than might have been expected Many young women have had children after a permanent ileostomy

Overaction of Endocrine Organs

This may be due to simple hyperplasia or to benign new growth The treatment is the same whichever it is and in most cases is surgical excision

A mild degree of primary thyrotoxicosis will sometimes recover with rest in bed and sedation particularly if the emotional cause of it can be removed More often if a long period of ill health is to be avoided more vigorous action is required Thiouracil and its derivatives inhibit the formation of thyroxine and are still used but their dose is difficult to regulate and the patient on them requires constant supervision Better results are obtained by reducing the amount of active gland by partial thyroidectomy The risk of it is small and most patients should be advised to take it Another way of reducing thyroid activity is by giving radioactive iodine This is picked up selectively by the thyroid but it is a much less certain method of proceeding as again the dose is difficult to regulate Indeed, contrary to what might have been expected myxoedema is more likely after radioactive iodine than after partial thyroid ectomy the results of which in this respect (considering the crudeness of the procedure) are unexpectedly good The risks of exophthalmic ophthalmoplegia are the same in both methods of treatment Further it is at least six weeks before radioactive iodine begins to reduce thyroid activity and it is probably unwise to give it to patients still in the period of active sexual life on account of the possible genetic risk associated with it So at present radioactive iodine is reserved for those unfit to stand or who for some reason refuse surgery

In a case of fibro cystic disease of bone with multiple fractures a parathyroid tumour can sometimes be felt and excised More often the thyroid gland must be explored to find it In a case of suspected primary overaction of islet tissue leading to hypo glycaemic attacks the abdomen must be opened An adenoma should then be found in the pancreas or between the pancreas and liver When Cushing s syndrome is due to an adenoma of

one adrenal cortex, the gland must be excised When it is due to cortical hyperplasia, the whole gland must be excised on one side and about four fifths on the other A phaeochromo cytoma must also be excised, and the slump in blood pressure that follows countered by the administration of nor adrenaline intravenously followed by methedrine intramuscularly until vaso motor control has become adapted to the absence of it The treatment of acromegaly is the least satisfactory of that of all the endocrine tumours If there are signs of rise of intra cranial pressure and/or of direct pressure on the optic tracts, pointing to a clinical anterior lobe pituitary tumour, it must be removed In the absence of signs of this kind excision of the pituitary is an unnecessary risk and deep X ray treatment should be tried first Good results are obtained in fifty per cent of cases

Benign and Malignant New Growth

Benign new growths do not call for action unless they are exalting function above the requirements of the body as a whole, they are unsightly or causing mechanical embarrass ment, they are obstructing a hollow tube or raising pressure in a confined space, they are predisposing to vascular congestion and leading to haemorrhage, or they are of the kind known to be liable to malignant change

On the whole they are not sensitive to ionizing radiation and other methods must be employed to get rid of them On the surface they are best excised If this is done skilfully, only a very small scar is left behind On mucous membrane, less easily accessible and where scar formation is of no particular consequence destruction by diathermy is the method usually adopted But there are exceptions to this general rule, for example, in congenital polyposis of the colon the chances of malignant change are so great that the whole area must be deliberately excised Within the body benign new growth, if causing symptoms, demands excision (as in the case of the endocrine tumours the treatment of which has already been discussed), the amount of tissue removed depending on the site and extent of it Thus a meningioma causing rise of intra cranial pressure or spinal compression can often be removed without any damage to the brain or spinal cord On the other

hand, in the case of a primary adenoma of a bronchus it may be necessary to remove the whole lobe of a lung and while a single fibroid can often be shelled out, multiple ones causing menorrhagia usually necessitate hysterectomy

Benign new growth of a diffuse kind sometimes demands treatment, the two most common in this category being primary polycythaemia and chronic leukaemia The former is treated with radioactive phosphorus which is picked up selectively out of the blood by the surrounding bone just as radioactive iodine is picked up selectively out of it by active thyroid cells The administration of it at intervals will usually keep the red cell count down to a reasonable figure and so reduce the constitutional symptoms of the disease and minimize the risk of thrombosis The chronic leukaemias are treated by means of X rays in myeloid leukaemia by exposure of the spleen in lymphatic leukaemia by exposure of the glands Treatment is not directed to the white cell count however Rather, the indication for action is anaemia resistant to iron and in the case of chronic myeloid leukaemia splenic discomfort or attacks of splenic pain

The treatment of malignant disease of mesodermal origin is unsatisfactory as it is usually diffuse or metastasizes quickly Excision of the primary is often unavailing and the only hope lies in deep X ray therapy or in the use of protoplasmic poisons or anti folic acid agents, on the principle that rapidly growing and dividing cells are more sensitive to all these methods of attack than other cells X ray therapy will certainly keep chronic Hodgkin s disease under control and cause local masses of glands to disappear, for many years It is also of value in the reticuloses Nitrogen mustard, a general protoplasmic poison is of some use in acute Hodgkin s disease and aminopterin an anti folic acid agent in the treatment of acute leukaemia

The treatment of carcinoma is more satisfactory Here there are three methods of attack radical excision ionizing radiation and altering the endocrine pattern of the body All three methods must often be judiciously combined

Radical excision depends on the principle of getting rid of a primary before metastasis has occurred, although there is evidence to suggest that metastasis occurs early in most cases and the good results obtained by removing the primary are not

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carcinoma of the rectum colostomy may be the only practical way of coping with the diarrhoea and when inoperable carci noma of the colon has been discovered at laparotomy colostomy *must* sometimes be performed as the only way of relieving the distension of the gut sufficiently to get it back into the abdomen

The sensitivity of different growths to ionizing radiation varies and the problem is to destroy them without burning the skin or damaging other normal structures It can, however sometimes be applied in ways which help to get over this difficulty Instead of exposing the patient to the high power X ray tube or to radium or radioactive cobalt from outside the growth in him can sometimes be surrounded with radium needles, which are pulled out after it has been exposed to a sufficient dose of radiation, or with metal seeds containing radon which can be left in position Different methods work best with different growths X ray treatment has proved most satisfactory in the treatment of rodent ulcer and radium is the method of election in that of carcinoma of the lip tongue pharynx and nasal sinuses Further ionizing radiation is extensively used in some inoperable cases notably deep X rays in carcinoma of the lung and secondary carcinoma of bone and radium in inoperable carcinoma of the cervix The radioactive isotope of gold can be injected into the pleural and peritoneal cavities and is of some value in controlling secondaries of the pleura and peritoneum respectively That of iodine is useful in the treatment of those rare cases of that rare disease, primary carcinoma of the thyroid in which the secondaries are thyro toxic and therefore take up iodine

Carcinoma of the prostate and of the female breast can be controlled to some extent by altering the endocrine pattern of the body If in the former the acid phosphatase level of the blood is not raised, secondaries in the bones are unlikely and then, provided there is no clinical evidence of extension through the capsule prostatectomy is the right treatment In many cases however the growth is through the capsule and there are secondaries in the bones already but even at this late stage, if the secretion of testosterone can be reduced the local growth will regress and secondaries fade away to be replaced by fibrous tissue There are therefore two alternative courses of

due so much to the prevention of metastasis as to the fact that the removal of the primary in some way inhibits the rate of growth of secondary deposits Be this as it may, it is the method of election in the treatment of all new growth of this kind with the exception of basal celled carcinoma of the skin (rodent ulcer) which never metastasizes and responds excellently to X rays and those in which the growth is in such a part of the body that excision of it is impossible or would be too mutilating for example carcinoma of the tongue, pharynx and accessory sinuses of the nose Nevertheless, operations for the excision of new growths are not anything like as radical now as they were at one time largely because ionizing radiation can be employed to prevent or at least control the growth of secondaries at the same time Again and again however, a decision must be taken as to whether an operation on a primary growth is worth while It is always so if there is no evidence of secondaries anywhere so that there is a chance of achieving a complete cure And even if there are secondary deposits already, or the growth has already extended beyond the limits of any hope of complete excision, it is still often worth while to operate For, not only may this decrease the rate of growth of secondaries, but it may make the patient more comfortable and his inevitable death less unpleasant both for him and his relations

On the other hand palliative operations which do not stop local extension but merely relieve immediate symptoms temporarily, for example, gastrostomy for inoperable carcinoma of the oesophagus and colostomy for inoperable carcinoma of the colon should be avoided So often they only enable the patient to live a little longer to die unpleasantly of local extension of his primary a little later Under circumstances such as these it is usually much better to relieve his symptoms with morphine, even to the point of keeping him more or less unconscious, and in the case of obstruction of the gut to keep it empty by suction drainage while he dies naturally and quietly of dehydration salt depletion and uraemia There is no necessity or moral obligation to resist nature and strive officiously to keep alive in these cases On the other hand, it is not always possible to follow this policy When the general condition of a patient is good the doctor s hand may be forced into some palliative operations For example, in inoperable

Sometimes the functional consequences of a degenerative process can be offset by physical means For example pres byopia due to loss of elasticity of the crystalline lens can be corrected by wearing glasses increasing deafness due to otosclerosis countered by means of an electric hearing aid difficulty in walking on account of pain or limitation of move ment due to osteo arthritis of a hip got over by means of a walking caliper In other cases it is better to tackle these problems surgically A cataract can be excised (It is wise the condition usually being bilateral to operate on the worst eye first) A fenestration operation may relieve deafness A plastic operation sometimes succeeds in giving a man a mobile hip joint or it can be fixed (arthrodesis) in order to relieve his pain But all these operations those on the ear excepted demand a *long period of rest in bed and before recommending them it* must be reasonably certain that the patient is sufficiently fit to stand up to that bed for the elderly being a dangerous place indeed

When intermittent claudication is due to degenerative changes in the tibial arteries nothing radical can be done about it and vaso dilator drugs are of little value but the patient should be encouraged to walk about as much as possible within the limits set by his pain in order to encourage the development of an anastomotic circulation Alternately warming and cooling his legs by immersing them first in hot and then in cold water is also said to facilitate this process Gangrene when it super venes should be treated conservatively If the dying digit is kept dry and clean and dusted with sulphonamide powder it will slowly amputate itself In some cases however on account of the extent of the gangrene or the pain associated with it or on account of spreading infection which antibiotics failing to get there are unable to control, it may be necessary to amputate the leg and in a case of this kind the decision must never be delayed too long Further on account of the condition of the arteries and to ensure healing of the stump amputation must usually be above the knee although it is often difficult to get the patient to agree to have it done He must be made to see that life in a wheel chair or on crutches is infinitely better than life with two legs, one of which is both functionally useless and a source of pain quite apart from the risk of infection spreading

action, bilateral orchidectomy or putting the patient on stilboestrol which antagonizes testicular secretion In practice the two procedures are often combined

Carcinoma of the female breast, particularly in patients after the menopause, also responds to altering the endocrine pattern of the body So in these days, instead of a radical amputation including resection of all the glands into which it drains, limited excision is the rule backed up by pre operative and post operative deep X ray therapy and stilboestrol which probably inhibits the secretion of androsterones by the suprarenal cortex The patient is also sometimes put on cortisone The latter does three things It reduces X ray fibrosis, so often one factor in the swelling of the arm on the affected side Secondly, it keeps the area open to stilboestrol arriving by the blood Thirdly, by inhibiting the activity of the suprarenal cortex still further it inhibits the growth of secondary deposits And when secondaries do actually develop in the bones, life may still be prolonged by reducing the secretion of androsterones to a minimum by removing both suprarenals, both ovaries, and sometimes the anterior lobe of the pituitary as well which controls all endo crine function, keeping the patient artificially supplied with cortisone But operations of this kind and on this scale to lengthen life by a few months are difficult to evaluate They should never be allowed to prolong suffering

THE INEVITABLE AGEING PROCESS

Time cannot be stopped and there is no method known to medical science of slowing down, arresting or preventing the degenerative processes which seem to be associated with the passage of it True that they may be due in part to over exertion, over smoking, excess in eating and drinking or to too high a protein or fat diet But, on the whole it is probably the stuff out of which a man is made, rather than the way in which he lives his life, that matters most Certainly there is far too little evidence as to their causation to justify any great modification of any ordinary sensible way of living, particularly as this often means cutting out one or more of those few things that a man has left to enjoy Old age must not be made miserable on medical theory

much more difficult for the elderly man with some degree of prostatic obstruction to pass his urine in bed Putting him to bed suddenly may even precipitate acute retention In both sexes, too, and in men with or without some degree of urinary obstruction, going to bed militates in favour of urinary infection just as it militates in favour of infection of the bases of the lungs, probably because the bladder does not empty completely just as the bases of the lungs do not fill completely Further in bed old people, particularly if they must be given drugs to help *them to sleep, are very apt to become confused and confusion* on this account, or due to low grade bronchopneumonic infection and anoxaemia, often conspires with urinary infection to lead to urinary incontinence The result is that the patient now has repeated wet beds and however carefully he or she is nursed these predispose to bed sores which an in dwelling catheter alone may prevent Nevertheless this predisposes to or aggravates existing urinary infection In many cases there fore it is necessary to decide which risk to take no urinary infection and bed sores or urinary infection and a clean skin? On the whole, in so far as any general rule can be laid down, an in dwelling catheter should be avoided until the skin position becomes untenable i e the skin shows signs of giving way Then an in dwelling catheter is necessary to save it, bed sores being a greater risk than urinary infection Indeed many old people stand up to urinary infection unexpectedly well Their bladders remain heavily infected but for some reason infection fails to spread up their ureters leading to pyelitis and uraemia

However under certain circumstances an elderly patient must be put to bed It may be necessary for him to have a cataract operation or an arthroplasty of his hip although under these circumstances the risk of a long period in bed must be weighed against the necessity for or the worthwhileness of one of these operations If he has suddenly bled from a chronic gastric ulcer he must be put to bed and kept flat at first but, as soon as he has been transfused sufficiently he must be sat up on account of the cardiac and pulmonary risks (which have already been sufficiently emphasized) and got up in a day or two The joint cardio pulmonary risk is probably greater than that of him starting to bleed again A patient who is to have a partial gastrectomy for a simple ulcer but has not bled can

up it and an enforced amputation a year or so later when the going is nothing like so good'

When intermittent claudication or threatening gangrene is limited to one leg and arterial pulsation cannot be felt at popliteal or femoral levels arteriography may demonstrate local obstruction in an iliac artery Under these circumstances an attempt can be made, if the patient's age and general condition permit, to relieve it by endarterectomy

Angina of effort must be treated along the same lines as angina cruris and with reasonable optimism The patient should again get about as much as he can within the limits set by his pain, to encourage the development of an anastomotic circulation in the heart itself Here vaso dilators do work however Tablets of glyceryl trinitrate will usually cut short an attack, and it is often worth while advising him to take one in anticipation of some special effort, for example, walking up a slight hill on the way to the station or even going up stairs in his own home

When the heart starts to fail on account of being required to maintain systemic or pulmonary hypertension, on account of coronary disease, or on account of all three together, the patient should be kept up and about as long as possible Old people stand congestive cardiac failure, provided it comes on slowly, much better, it will be found, than might have been expected Indeed, aided by regular digitalis and a weekly injection of a mercurial diuretic or chlorothiazide regularly by mouth they can sometimes lead a reasonably mobile life for years in spite of some oedema of their lungs and some oedema of their feet It is bronchopneumonic infection, rather than 'father doing too much," which so often precipitates congestive failure in the elderly So putting them to bed by restricting the movement of the lungs makes the heart far more likely to fail than when the patient is up and about True that his lungs *can* be 'covered with antibiotics but if this policy is adopted on a too liberal scale it leads to the development of resistant strains of pathogenic organisms On the whole it is wiser to withhold antibiotics until a patient actually begins to get signs of bronchopneumonic infection

Another risk of the elderly patient taking to his bed, and a further reason why he should be kept out of it as far and as long as possible, is urinary complication of some kind It is certainly

the age of sixty five or sixty seven is as much to be deprecated as compulsory retirement at that age from active physical employment For part of the art of living is to keep an interest in life until the very end and this must often be actively encouraged when a man no longer has any work to do The anxiety neurotic must now be disciplined not to live in fear The hysteric must not be allowed to lapse into a state of hypo chondriasis, that is to say getting emotional satisfaction out of morbid preoccupation with his failing health and some times *the imaginary failing health of his body* In short the psychoneuroses of the aged create the same problem as the psychoneuroses of the young and are perhaps more difficult to handle But much can be done by kind discipline and common sense, particularly if the co operation of near relatives can be obtained Involutional melancholia is easier to handle for like that other psychosis endogenous depression, it reacts to physical treatment directed at the brain E C T will often restore the normal emotional level of the mind and with curarine to prevent the muscular concomitants of the fit it carries little risk even in the aged

THE VERY ILL PATIENT

In health a man maintains himself without thinking He eats when he is hungry and instinctively eats more or less the right things and drinks when he is thirsty He goes to bed when tired and gets up when rested He protects his skin whether sitting or lying by shifting from one position to another when he feels uncomfortable Further, all his protective reflexes are active Not so however when he is very ill Then he must be deliber ately maintained

The first question which arises is that of his position although he has usually decided this correctly for himself already If he has difficulty in breathing either on account of some cardiac or pulmonary cause he will be found sitting up if febrile, shocked or unconscious lying down and must be nursed like that In acute anaemia due to haemorrhage with reduction of blood volume he will also be nursed flat or even with the foot of his bed raised on blocks, but in chronic anaemia with normal blood volume sitting up on account of the risk of congestive

usually be got up next day On the other hand, although elderly patients should always be kept in bed as short a time as possible, both after surgical operations and acute medical illnesses they require much longer periods of convalescence than the young

Vascular accidents create another difficult problem After cardiac infarction the patient must be kept in bed for a while, but in most cases a fortnight will be sufficient time for the infarcted area to heal and the risk of getting an elderly patient up after this, even if his heart has begun to fail a little will probably be less (for the reasons already stated) than insisting on strict rest in bed for the 'statutory' period of six weeks When he has had a cerebral vascular accident, either haemorrhage or thrombosis he should be got out of bed on to a chair, even though it requires two nurses to do it every time, as often and as much as possible and a start should be made at attempting to make him walk as soon as spasticity in his paralysed muscles shows any signs of being able to bear the weight of his body If he is aphasic a therapist may be able to help him learn to talk again

When the brunt of the arteriosclerotic process falls on the basal ganglia and the patient becomes Parkinsonian,' hyoscine benzhexol or ethopropazine sometimes help to reduce his rigidity But no drugs influence his tremor much Indeed, it is a condition for which little can be done by medicine surgery or physiotherapy, and in most cases it is slowly progressive Before long he may become incapable of looking after his most elementary personal needs and more or less permanent nursing attention is now required Nor can much be done when the higher centres wear out before the rest of the body (senile dementia) or arteriosclerotic change in the cerebral vessels begins to affect the frontal lobes on which the mind is based The former are usually quiet but require more and more nursing attention as the mind slowly slips away The latter may become manic, depressed obstreperous or violent and require drugs or even physical restraint

More often the brain and therefore the mind, outlast the rest of the body and the patient is faced with the problem of growing old consciously and it is the doctor s duty to try to help him to do it with good grace Compulsory retirement at

every two hours if bed sores are to be prevented Moisture and dirt also conspire with pressure to produce bed sores so he must be kept scrupulously clean by washing twice a day as a routine and also after every dirty bed, and his skin kept dry by repeated application of some absorbent powder

In a short illness diet is unimportant The patient has sufficient reserve of fat and protein to see him through it without appreciable loss of weight In a prolonged illness, and seldom can it be foreseen exactly how long a patient is likely to be ill he must be fed up to his full calorie requirement and if he is febrile, well above it But this may be very difficult as he is likely to be suffering from serious loss of appetite and it is useless to prescribe some complicated and unattractive diet destined to be sent away untouched Rather his appetite must be tempted by putting attractive food before him Milk the protein, carbohydrate and fat mixture (400 Calories to a pint) designed by nature for the developing child, is also the best basis for the diet for the sick man It can be enriched by the addition of cream (fat) sugar (carbohydrate) and caseinogen (protein) a number of proprietary preparations of which are on the market, or by the addition of eggs an average egg containing 90 Calories Further it can be reduced in bulk by conversion into soups custards, omelettes and junkets, and rendered attractive by the use of flavouring agents savoury or sweet, or incorporated into real ice cream Lean meat, especially white meat and bread and butter can usually be allowed Indeed no gross modification of a man s normal diet is necessary merely on account of high fever Rather, it is a question of making it more attractive lighter ' and serving it in repeated small feeds as a rule not more than five fluid ounces at a time Common sense also dictates that its vitamin content should be deliberately increased

An adequate supply of water is essential particularly if a patient is vomiting losing water and chloride, or sweating profusely, losing water and salt or has diarrhoea, losing water salt and potassium It must also be remembered that he may be too weak or ill to put out his hand to get water for himself Or his level of consciousness may be so depressed that the subjective sensation of thirst which normally protects his body against primary dehydration may have temporarily ceased to

heart failure if he lies flat Children with acute heart disease, as opposed to heart failure, are usually nursed flat as it is easiest to keep them still in that position, but even a child must be sat up, if its heart starts to fail Adults with acute heart disease are always nursed in that position on account of the risk of failure coming on at any moment Elderly people, too are always best nursed sitting up on account of the risk of precipitating congestive heart failure by lying them down but when *bronchopneumonia supervenes the risk of lying them down* for short periods at a time must often be taken, and it may even be necessary to raise the foot of the bed, to help them cough up their sputum Indeed, a difficult decision often has to be taken between the alternative risks of increasing bronchopneumonic infection, if the patient is nursed sitting up all the time, and increasing congestive cardiac failure, if he is occasionally nursed lying flat *If a patient has had haemoptysis or is* suffering from pleural pain on one side, he will be tilted towards it to keep that lung relatively quiet When pus has formed, he will be kept in or repeatedly turned into that position in which gravity favours drainage Hence, for example, the rationale of nursing a patient with suppuration in his peritoneal cavity in Fowler s position

The next question is the kind of surface on which he should lie or sit Here there are four choices He can be nursed on a stuffed spring mattress (which can be covered with rubber sheeting), on a rubber foam mattress, on water pillows or on air cushions When he is not so ill that he cannot move about at will, and there is no risk of incontinence, an ordinary stuffed spring mattress or rubber foam mattress is safe There is no serious danger of bed sores due to the prolonged action through the same area of his skin of his unsupported body weight When he cannot move about himself when he must be immobilized or when the lower part of his body is paralysed, the risk of bed *sores is too great and is particularly great if he is on steroid* therapy Under these circumstances, when he is to be nursed sitting up, a pneumatic ring is the answer to the problem If he must be nursed flat he should lie on water pillows water being incompressible and adapting itself accurately to the contours of his body, spreading his weight over the largest possible area of his skin Even then he must be turned slightly

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blood and tissue fluids means that sooner or later potassium from the intracellular fluid starts to pass into the blood and potassium *is then excreted as well* So *daily estimates of the plasma* electrolyte levels are often needed and are particularly important when water begins to return into the cells as the serum potassium may then fall to a dangerously low level

The rate at which rehydration should be attempted depends to a certain extent upon the speed at which dehydration developed In general it is usually safe to do it about three times as quickly, working rather more quickly at the beginning of treatment, and tailing speed off gradually This is certainly wise if the plasma proteins are low as under these circumstances water logging of the interstitial tissues may occur unexpectedly Further, it is wise to estimate the amount of chloride being passed in the urine at frequent intervals When it reappears in normal quantities, it means that restoration of electrolyte loss is going ahead fast enough even though the blood levels are not yet quite normal But an *excess* of chloride in the urine with a *low* level in the plasma suggests that the kidneys have lost their power to retain salt Under these circumstances it may be necessary to administer a hypertonic solution of sodium chloride and even to give injections of cortisone

Fever should usually be allowed to run its natural course but the patient must be given enough water (and enough salt) as already emphasized with which to sweat and to enable him to maintain adequate secretion of urine (this in the case of a very ill patient should always be saved and measured along with his stools enabling an intake output fluid chart to be maintained) Only in hyperpyrexia i e continued fever above 103 or 104 should active steps ever be taken to reduce fever by sponging him with tepid water Fever predisposes to lung infection, however and his lungs should be covered with *penicillin or with a wider spectrum oral antibiotic such as* tetracyline if he begins to develop signs of bronchopneumonic infection

Any very ill patient on a milk diet and particularly one with diarrhoea, and particularly a child is liable to fungus infection of the mouth, and particularly liable to it if on oral antibiotics He also *runs the risk of ascending infection of his salivary* glands So his mouth must be kept clean and, if he is not strong

operate Further, no *subjective sensation protects it against salt* depletion and enough salt and potassium must always be given to counteract loss of the former in the sweat and loss of both in the stools They can easily be given but both are easily and often forgotten

When a patient is already dehydrated on account of sweating, vomiting, continuous gastric aspiration, diarrhoea or diuresis (as opposed to lack of water to drink, a very rare condition), his dehydration is always largely due to loss of electrolytes Thirst has been slight and the deficiency of water in his body may now amount to as much as four or five litres and this loss must be made good remembering that it will continue to pile up until the underlying pathological process is relieved It must also be remembered that the continuous insensible loss of fluid from the surface of his body and the internal surface of his lungs (amounting to at least 800 ml in 24 hours) and the loss by the normal excretion of urine (amounting to about 1,500 ml a day) will continue unabated So the total quantity of water and electrolytes which he will require must now be calculated by adding the estimated deficit of both at the start to the loss of both likely to accrue during treatment

Solutions of electrolytes can be given by mouth if only small quantities are required The very ill patient, however, can rarely summon sufficient strength to swallow more than three litres a day although a naso oesophageal tube may do away with this difficulty (unless the cause of his dehydration is due to disease of his oesophagus or stomach) Only about a litre, administered slowly *per rectum*, can be absorbed from the colon and the subcutaneous injection of fluid is not of much value except perhaps in infancy So in most cases an intravenous drip should be set up and isotonic *electrolyte solutions run* directly into the blood

The actual solutions used are decided partly by the nature of the disease giving rise to the patient s dehydration and partly by the concentrations of electrolytes in his blood as soon as these can be estimated Diarrhoea demands sodium, pot assium, chloride and phosphate vomiting and continuous gastric suction, chloride (most easily administered as sodium chloride), the diuresis of hyperglycaemia chloride and sodium But it must be remembered that loss of salt and water from the

myocardial efficiency sometimes declines A more physiological method of obtaining the same result is by means of a solution of nor adrenaline given by continuous drip The trouble is that it may lead to gangrene of the skin of the extremities Giving cortisone should also be considered It helps to raise the blood pressure, and at the same time suppresses to some extent any abnormal reaction giving rise to shock In certain circumstances it is also possible to reduce the metabolic demands of the vital centres by lowering the temperature of the whole body by artificial cooling This procedure is particularly useful as a prophylactic measure when it is known that a patient is liable to develop shock, for example, during a prolonged surgical operation Hypothermia is now extensively employed in operations on the heart and brain to reduce the amount of oxygen they require and so permit longer periods of enforced ischaemia The patient is allowed to return to his normal temperature while still under the anaesthetic

The nutrition of a patient s muscles must be maintained as far as possible while he is ill as if this can be done, it will shorten his period of convalescence While he is desperately ill admittedly, apart from every effort at feeding, little can be done but, when he starts getting better massage can be begun later passive movements and before long active exercises (It is frequently forgotten how much exercise he can take while still lying on his back in bed) Further, action on these lines militates against the risk of deep venous thrombosis a not infrequent complication of a serious illness as a patient starts getting better (for some reason it seldom occurs during the height of an illness) and it is hardly practical to put every convalescent patient on anticoagulants Physiotherapy and voluntary leg exercises in bed, as soon as the patient is fit enough will however do much to prevent it

Lastly, there is the problem of the patient s mind based on and its reactions for the time being largely conditioned by the physical state of his body If, as sometimes happens in a short high fever, he becomes actively delirious, excitable, struggling to get out of bed, one of the stronger hypnotics must be given In a longer fever he is likely to lie quiet in a low muttering delirium and no particular action is required Under these conditions he will have little idea of what is happening and still

enough to clean his own teeth and gums, it must be swabbed out after every feed Nausea is a common symptom, particularly in uraemia Antihistamine drugs and pyridoxin may help to control it but sometimes the only way in which to control vomiting is to wash out the stomach and then keep it empty by suction drainage, being careful to counteract the inevitable extra loss of water and chloride by giving saline parenterally

Chemical aperients should be avoided, particularly in the typhoid fevers but the colon should be kept empty by means of soap and water enemata Diarrhoea is a more serious symptom Not only does it lead to dehydration and to salt and sometimes to potassium depletion, but it disturbs the patient s rest and when he is incontinent leads to frequent dirty beds necessitating frequent correspondingly long periods of nursing attention It must always be controlled (page 330) as far as possible

Sleep is essential to life and particularly necessary in disease, which however, through pain, cough, fever, diarrhoea or incontinence, so often militates against it So also does the atmosphere of and the traffic through an open ward, and repeated clinical investigations Hypnotic drugs must be given and the investigation of an ill patient planned so as to give him as much peace and rest as possible

All patients with fever tend to become anaemic and in the presence of it iron by mouth, and even iron by intramuscular or intravenous injection, often proves ineffective in maintaining the haemoglobin level of the blood which must never be allowed to drop below sixty per cent for any length of time So blood is often necessary and it is always safer to give several small rather than one large transfusion For, unless a patient has just bled his blood volume is normal and in an elderly one particularly it is most important not to overload his circulation suddenly This might precipitate heart failure So in the trans fusion of a patient with a normal blood volume packed cells are always preferable to whole blood

In fall of blood pressure due to overwhelming infection or myocardial infarction, the use of long acting synthetic vaso constrictors, such as methylamphetamine, given by intravenous or intramuscular injection every half to one hour may raise it but they tend to accelerate the pulse with the result that

knowingly watch him go and their feelings must be taken into account At each turn for the worse it must be explained to them that nothing further can be done or should be attempted in any vain endeavour to keep him alive, although a request *for a second opinion, unless it will cause the patient himself too* much distress and discomfort should rarely be resisted For, when the end does come, they must feel that everything possible was done to save his life There must be no feeling that this or that should have been done and that if it had been done his life might have been saved

In these days of antibiotics and successful preventive medicine, however, death as the result of an acute illness, such as pneumonia or typhoid, is relatively rare Most people die otherwise Some people are killed in accidents and it is the privilege of a few to die suddenly of a massive cardiac infarct or a sudden cerebral haemorrhage The majority die gradually of progressive failure of some vital function complicated towards the end by bronchopneumonic infection, or of the consequences of progressive inoperable new growth

Sudden death against a background of previous perfect or reasonable good health creates no particular problems for the doctor *vis a vis* his patient But it is often difficult explaining to his relatives particularly if the doctor knew that his blood pressure was high or that the pain in his chest was cardiac why nothing was done and so little was said while he was still alive In point of fact nothing could have been done about it and that is why so little was said It was better letting him live without anxiety This must be explained to them now For, if it is not done again and again near relatives start blaming the doctor or themselves If only we had taken him to see a specialist! If only mother or father had not been allowed to do this or that, they think, then he or she would never have died Ideas of this kind grow in the lay mind very easily but are very seldom true They cause untold regret and must be actively prevented

Far more often death is due to progressive failure of some vital function and most commonly due to heart failure Under these circumstances the patient almost always knows that his heart is the weak link in the chain of his existence and that he is bound to die prematurely, on ordinary standards of heart

less of what is likely to happen to him Rather, the problem arises when he is in possession of all his faculties He may be too ill to read or listen to the wireless but not necessarily too ill to think, worry about his family and affairs and get scared as to his chances of recovery Hope, therefore, as far as it can be legiti mately held out, stretching a point if necessary, must be actively maintained and the will to live encouraged This can only be done by ascertaining the fears in the mind of the sick man, creating confidence by explaining his illness and what is being done about it to him and holding out every legitimate hope of recovery The co operation of the hospital chaplain of his denomination can also be sought and it is absolutely essential to secure the active and intelligent co operation of his relatives and friends True that he must be protected from the wrong visitors, and a very ill man cannot stand, and does not want, the many who so often feel in duty bound compelled to come to see him But the right ones, if the reality of the situation is explained to them and they can be coached into saying the right things, can help doctors and nurses to maintain that psychological environment of optimism round his bed which, although its value can never be assessed exactly, seems so often to militate in favour of recovery

THE DYING MAN

When, in spite of treatment or in the absence of any satis factory treatment for a disease, a patient becomes progressively more and more ill and the doctor sees that his chances of recovery are becoming daily smaller and smaller, the patient's own appreciation of the fact that he may die or is actually dying, often gets less and less This is partly due to his disease and partly due to the drugs which are usually given in these days to relieve pain or respiratory distress and promote sleep It is also sometimes in part a psychological phenomenon On the whole death bed scenes are fictions of the imagination of the novelist In real life they are now seldom met

From the point of view of preparation for death in the face of acute illness, other than that due to accidents, the doctor is more concerned with the patient s near relations than he is with the patient himself He drifts out unknowingly They must

may also demand it or he is the kind of man whose faith is such that he would prefer to know that he is a dying man *before* his mind becomes clouded either by drugs or by disease These are exceptional cases however Most men and women although often protesting strongly before the situation actually arises that they would 'want to know when the time comes prefer to drift out of life unknowingly never having consciously and deliberately faced the reality of impending death So usually the doctor has to decide what to do himself and the advice of the nearest relatives should first be sought although not necessarily accepted The younger generation do not necessarily under stand the different outlook of the older man

Almost certainly too the doctor will prevaricate at first There is never any necessity to rush into it If the patient repeatedly refuses to accept his doctor s prevarications as he gets worse, then almost certainly he is of the stuff that should be told the stark truth and it will be unwise to withhold it longer He may take it better than is expected and may have guessed it in part himself already If on the other hand he accepts the doctor s sometimes rather lame prevarications and does not ask again, he has probably constructed his own psychological barrier against being compelled to face the truth and is of the much more common kind who when their time comes, prefer to go out on the tide unknowingly And it is right to let them do so If they were told either they would not accept it or the collapse of morale would be too great and serve no useful purpose Sooner or later however the situation must be explained to the nearest responsible and level headed relative, and occasionally however unpleasant it may be everyone concerned must be mobilized to keep up the atmos phere of optimism in respect of ultimate recovery when in reality no hope whatever exists

The second problem before the doctor is that of the admin istration of the stronger analgesic drugs to relieve his patient s pain or physical and mental distress Common humanity dictates that they be given in sufficient doses and most religions raise no objection although some demand that the patient should know that he is dying, and have the opportunity to make his peace with God before they start to cloud his understanding as undoubtedly they will and to some extent to alter his

failure eventually Here the doctor s duty is plain It is to foster optimism and keep him as comfortable as he can for as long as he can within reason But in cases such as these there comes a time when without saying anything about it (the patient's friends if they have any intelligence at all must have guessed that death is not very far away), he should withdraw any drugs which are keeping him *artificially* alive notably the antibiotics and vaso pressor agents, and put him on hypnotic Not of course in lethal doses, that would be euthanasia and the law does not legalize that and should and could not do so But on ordinary doses of the standard hypnotics, increased only above pharmacopoeial level as the patient develops tolerance to them he often gets better for a while and then sleeps out his days in peace and dies of natural causes

When a patient complains of symptoms which interfere little with his ordinary life but is found on examination to be suffering from some untreatable and lethal pathological process, for example inoperable carcinoma, the management of the dying patient (a most important part of clinical practice, seeing that everyone dies eventually) is much more difficult He feels a fit man now but the doctor knows what no one else knows at the moment, namely, that before long his patient will be a very sick man indeed So the doctor is faced with two problems one immediate, the other for the moment remote First, should he be told? The second, how can he help him out of this world, as the functional efficiency of his body declines, with the minimum of pain and misery?

Should the dying man be told? That problem is often discussed although as a matter of fact it arises much less often than might be supposed Indeed, it only really arises in circum stances such as these and not in the other modes of dying that have already been considered Either he can be told the truth at once or be allowed to lapse as quietly as possible into uncon sciousness, when the time comes, without ever having realized when he was fully *compos mentis* that he was in fact a dying man This decision, often difficult will depend on the position of responsibility, the religious faith, and the strength of character of the patient Men in responsible positions must often be told The circumstances of their lives and even the fate of many other people may demand it The religious faith of a patient

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individual personality (The doctor must respect the religious tenets of his patient and not attempt to impose his own on him when he is dying) After that he is free to step up the analgesic and hypnotic drugs as already described (page 316) as fast as is necessary to keep his patient's symptoms under reasonable control True that this often means very large doses of morphine or heroin, chlorpromazine and the stronger barbiturates, but let this fact be stated categorically *Analgesic drugs given on this scale and in this way do not shorten life* This is *not* euthanasia Rather, by relieving pain and slowing down the metabolic process in the body, they prolong life but prolong it to let the patient depart from it in peace

In conclusion let it be remembered that the object of medical practice is to relieve human suffering and prolong life as long as *reasonable* life can be prolonged On the other hand, the doctor is not under either a legal or a moral obligation to keep any patient of his alive to the last possible moment which modern scientific technique may permit So often it is better to let nature take its course, and in the minds of those left behind inculcate a right attitude to the natural phenomenon of death—

"Sleepe after toyle, port after stormie seas
Ease after warre, death after life, does greatly please " *

* Spenser *The Faerie Queene* Canto IX 40